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FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

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## Air Safety in the Balance

TWO major fatal accidents reported this week raise the question of whether air safety legislation is keeping pace with the growing complexity of transport aircraft. The chairman of the Air Registration Board, Lord Brabazon of Tara, was clearly of the opinion in his speech to the Guild of Air Pilots and Air Navigators (page 319) that complexity is dangerous in itself, because of its demands upon the pilot. His implication was that aircraft, while under pilot control, must become inherently less safe as their capabilities are extended.

So emotional are the overtones of air safety that the completely dispassionate view is not easily obtained. Yet it is true that of this year's disquieting number of fatal accidents to transport aircraft in service not one can be attributed to a recent advance in design technique. Perhaps as the result of a measure of good fortune, no fatal accident has occurred in service to that most complex of transports, the big jet—although fatalities have occurred in demonstrating to pilots under training the considerable skill that they must expect to acquire. The decision by the ARB to require modification of the Boeing 707-436 before it was certificated shows a refusal to accept the need for an unreasonably high standard of pilotage during the phases of flight on which reliance is placed on manual control. Boeing's action in making parts available on a free-issue basis when approval by the US authority had already been obtained adds lustre to the reputation already enjoyed by the Seattle firm.

But when the pilot's function becomes solely that of systems monitor—what of complexity in relation to safety then? Are high approach-speeds (related not to zero, but to a practical minimum slant or vertical velocity) dangerous in themselves when reliance is placed on computed approach paths? Or is this part of the give-with-one-hand take-with-the-other balance that has marked air safety and aircraft progress since powered flight began 57 years ago?

## The Tiny Turbines

AS Dr E. S. Moult observed in his Blériot Memorial Lecture, delivered in Paris this week, it was expected at one time that small turbines would replace the excellent four-, six- and eight-cylinder piston engines in the 100-400 h.p. class which have found such widespread application in business, touring and club aircraft. Within this spectrum of power the gas turbine is exceedingly attractive; but it has failed, so far, to approach the piston engine either in first cost or consumption.

This noted British engineer is a man with exceptionally wide experience of both piston engines and gas turbines in their smaller sizes. Thus, he must be heeded when he says that considerable efforts are likely to be made to improve the small gas turbine in its two deficient respects, and that as these efforts succeed, the use of the piston aero-engine "will approach vanishing point."

This pronouncement should not be construed as too distant a vision. Already there is evidence that turbine-powered executive aircraft are excitingly near at hand. *Aviation Week* has just reported an official of the Beech Aircraft Corporation as saying, "Turboprop-powered business planes are five years closer today than they were a year ago"; which is construed to mean that Beech now believe that such aeroplanes could be available between 1960 and 1965.

That the foregoing should be of more than casual interest to British constructors must be apparent from a recent editorial wherein we called attention to the immense potential of the American executive market.

# FROM ALL QUARTERS

*ROYAL JESTER? This cheerful picture was taken during the Duke of Edinburgh's visit last Friday to Smiths' factory at Cheltenham. With A. J. A. Majendie (left), the Aviation Division's director of operational requirements, and Sqn Ldr John Severne, his equerry, the Duke is in a D.H.121 flight-deck mock-up. Visible on the coaming is one of two long, narrow cases, hitherto unmentioned elements in the 121's advanced flight-control system*

## Avons for United

THE value to Rolls-Royce of Avon turbojets to power 20 Sud Caravelles ordered by United Air Lines of Chicago (see page 320) is £3.3m ($9.24m). The order is the first to be placed by an American domestic airline for non-American jet engines and is the largest single order for British aero engines received from any airline in the USA.

The Avon for United is the 531R (with thrust reverser) of 12,080lb guaranteed minimum thrust—a development of the engine which has been in successful operation in Comet 4s and Caravelles for nearly eighteen months.

## New East German Jet

BRIEF details of the BB.155 transport have become available, as a result of the placing of the contract for the electrical system with English Electric. The 155 is the latest project from the Vereinegung Volkseigener Betriebe Flugzeugbau of Pirna/Elbe in the German Democratic Republic. Like its precursor, the BB.152 (page 323), it has been directed by Prof Brunolf Baade and it is being built at the VEB plant in Dresden. Few details are available beyond the fact that it is a short-haul jet powered by twin Pirna type 014 turbojets (four of which are used in the BB.152) and that it will have an advanced constant-frequency electrical system essentially similar to those employed in the latest V-bombers. The systems will be manufactured at English Electric's aircraft equipment division in Bradford, against a firm order for £50,000 and a letter of intent for £130,000.

## Hawker Siddeley Board Appointments

FOLLOWING completion of the de Havilland and Blackburn merger with the Hawker Siddeley Group, five new appointments to the group's board were announced on February 25. They are those of Sir Aubrey Burke (chairman of de Havilland), who becomes deputy managing director to Sir Roy Dobson; J. A. R. Kay and J. T. Lidbury, who are made joint managing directors of Hawker Siddeley Aviation Ltd, which is parent to all the HS aviation interests; Arthur Jopling, present chairman of Blackburn; and A. S. Kennedy, a director of de Havilland.

In a statement welcoming the appointments, Sir Roy Dobson said: "When we made our offer to de Havilland and Blackburn shareholders, these appointments were promised and these promises are now fulfilled. I am sure they will enjoy their appointments, particularly Sir Aubrey, and I am looking forward to some relief from the heavy load which I am now carrying. As for Mr Kay and Mr Lidbury, nothing gives me greater personal pleasure. Mr Kay, who is 45, has served the Group for 27 years and Mr Lidbury, who is 47, for 23 years. They have both worked their way up through the ranks."

With the new appointments the Hawker Siddeley board numbers 13 members; they are: Sir Thomas Sopwith (chairman), Sir Roy Dobson (vice-chairman and managing director), Sir Aubrey Burke (deputy managing director), Hugh Burroughes, H. T. Chapman, J. F. Robertson (financial director), Sir Arnold Hall, H. G. Herrington, Sir Halford Reddish, J. A. R. Kay, J. T. Lidbury, Arthur Jopling and A. S. Kennedy.

*VANGUARDS on the line were inspected by Mr Sandys, Minister of Aviation, during a visit to the Weybridge works of Vickers - Armstrongs (Aircraft). Escorting him is Sir George Edwards, right, managing director. The Minister travelled by helicopter to Wisley Airfield, where he was met by Lord Knollys and other Vickers directors*

## Mach 3 VTO Me

IT is reported by our French contemporary *Les Ailes* that the vertical take off aircraft being built by Messerschmitt will be capable of Mach 3 performance. Of modified delta planform, it will be powered by six Rolls-Royce RB.153 turbojets each of 4,960lb thrust. Two of these will be installed vertically in the fuselage for direct lift; the others will be mounted in pairs in nacelles, pivoting at the extremities of the wings for lift as well as for propulsion.

## Saunders-Roe Directorships

A STATEMENT issued by Westland Aircraft on February 25 said, "It has been agreed that Capt E. C. Clarke, CBE, MC, will withdraw from the managing directorship of Saunders-Roe Ltd and from the board of Westland Aircraft Ltd. This change will take effect from March 1, 1960. Mr. H. W. D. Winkworth, MIProdE, has been appointed director in charge, Saunders-Roe Ltd, as from the above date."

Capt Clarke, who is 61 years of age, joined Saunders-Roe as commercial director in 1937, was appointed joint managing director in 1939 and became managing director in 1945. Mr Winkworth went to them as production engineer in 1946, became assistant general manager in 1957 and works director in December 1958. He started his career 32 years ago as a Short Bros. apprentice.

## The English Electric Year

REVIEWING the year's work of English Electric Aviation Ltd in his statement in advance of the a.g.m. (to be held on March 17), Lord Nelson of Stafford, chairman of the parent company, spoke of steady progress with Lightning development and production and with initial work on the TSR.2 project. The development batch of Lightnings was completed last year, he said, and flight development was continuing prior to the entry of the aircraft into service this year; production aircraft were now flying. Development was also continuing on later marks; orders had been received for several of these during the year, and two prototypes of the two-seater version made their first flights during 1959.

Referring to the loss of the first two-seater prototype in the Irish Sea, Lord Nelson paid a tribute to J. W. C. Squier (who, it will be remembered, reached land in his dinghy). "This type of test work, in advance of any in this country," he said, "makes immense demands on the men taking part in it and the company recognizes gratefully the risks they run."

Reviewing the guided weapon side of the company's work, Lord Nelson said that of greatest significance to the company's weapons programme had been Thunderbird's outstandingly successful service acceptance trials. The year had seen a steady

flow of Thunderbirds to the Army's training establishments and to the new Guided Weapons Regiments of the Royal Artillery.

"Development of Thunderbird's successor is also proceeding apace," added the chairman. "Making use of the most advanced radar techniques yet retaining Thunderbird's essential features of mobility and reliability, it will provide increased range and improved performance against the low-level intruder."

During the year, added the chairman, it had been made public that the Division was engaged on a third major project for the Army, the Blue Water medium-range mobile ground-to-ground weapon designed to replace conventional corps artillery. [This is the first time English Electric have publicly referred to Blue Water by name.]

Other work of the English Electric Group reviewed in the statement included that of Marconi, special mention being made of the radar system inaugurated at Jersey Airport last June by Princess Margaret, and of Napier with their successful demonstrations and sales of the Eland.

## Guild of Air Pilots' Banquet

AT Grocers Hall in London on February 23 the Guild of Air Pilots and Air Navigators held their annual banquet. The Grand Master, the Duke of Edinburgh, was unable to attend owing to Royal Family mourning, but in a telegram he expressed the hope that "the guests will take away a good impression of our Guild."

Sir Frederick Tymms, the immediate Past Master, proposed the toast of the Lord Mayor and Corporation of London and the Sheriffs, to which the Lord Mayor, Sir Edmund Stockdale, replied.

As president of the Royal Aeronautical Society, Peter Masefield next proposed the Guild; and the Master, Dr K. G. Bergin, in a marathon speech, replied and also proposed "The Guests." Much of his speech was concerned with safety in the air. With the greatly increased density of air traffic which must be expected in the next few years, he said, the Guild had proposed to the Minister that there should be unified control of civil and military flying if safety was to be assured. London Airport, "the Piccadilly Circus of the air world," should have unified air control in both horizontal and vertical planes.

On the subject of the new College of Air Training—"a long-felt need"—the Master hoped that it would become the university of the air. Sir Hugh Walmsley, the principal-designate, was specially welcome. The chairman and three members of the board of governors were members of the Guild; it was imperative that the highest standards should be observed.

Dr Bergin went on to speak of accident investigation—important, he said, because from findings came the possibility of avoiding further accidents. An airline pilots' and navigators' committee had been set up by the Guild to study supersonic flying and would send its recommendations to the Minister.

The final speaker was Lord Brabazon in his capacity of chairman of the Air Registration Board (although he was announced only as "Citizen and Blacksmith"). The latter part of Lord Brabazon's speech was of particular interest, since it was concerned largely with modern air transport and aircraft; we make further reference to it on page 319 and in a leading article.

He had earlier mentioned that he was able to confirm that the stork which had visited Buckingham Palace had a current British C of A and had found its destination easily with the aid of Decca. Lord Brabazon then referred to the things which had struck him as odd in the 52 years since he had first "got up" in an aircraft.

## The 504 Dinner

APPRENTICES of the 504 Club held their ninth annual dinner at Londonderry House last Friday, and once again Sir Roy Dobson took the chair; a goodly number of both the original and the new apprentices were able to attend. J. A. R. Kay, recently appointed to the Hawker Siddeley main board, received his badge and cuff-links on becoming vice-president of the club.

The guest of honour was Sir Alan Cobham, who amused everyone by his lively stories of his early flying and air circus days. Maj S. V. Sippé had proposed his health and that of the guests.

The company was proposed by E. Shires, and in replying Sir Roy Dobson surprised some by indicating that he had no worries about the number of aircraft to be built, but that his company's difficulty was to find the men. He added that Great Britain was the best training ground in the world—for technicians to do the job and not just to pass exams. Sir Roy also offered a few plain facts on the subject of mergers and the purchase of a company with hard cash.

The Avro apprentice of the year, who becomes a new member of the club, was Alec Hopwood, who, as is the custom, received the trophy and links from Sir Roy.

***HONOURED BY THE GUILD:** The Lord Mayor of London, Sir Edmund Stockdale, presents the awards of the Guild of Air Pilots at the banquet reported on this page. (Another picture, page 319.)*
**In the first picture he is handing the Johnston Memorial Trophy to the Decca Navigator Co, represented by its chairman, E. R. Lewis; in the second, James Martin, chairman of Martin-Baker Aircraft, receives the Cumberbatch Trophy; below, Hawker chief test pilot "Bill" Bedford takes the Derry and Richards Memorial Medal; and Wg Cdr C. E. F. Arthur, CFI of Fair Oaks Aero Club, receives the Award of Merit. Details of the awards were given on page 166 of *Flight* for February 5**

## IN BRIEF

Eight Morane-Saulnier 760 Paris (two Turboméca Marboré 2) have been bought by the Brazilian Government, who have also taken an option on 22 additional machines of the type.

A Westland Widgeon was recently used experimentally by the South-Western Electricity Board to inspect a 30-mile length of power line. It has been unofficially estimated that one helicopter crew could complete in an hour an inspection that might take a six-man lorry team four days. The technique is regularly employed abroad, particularly in North America.

We regret to learn of the sudden death, in Lagos on February 17, of C. C. McCarthy-Jones, managing director of Air Stock West Africa Ltd. Prior to forming ASWA in 1958, Mr McCarthy-Jones had been sales manager of Air Trainers Link Ltd. He joined the RAFVR in 1938 and served during the war with Fighter Command, Training Command and Army Co-operation units. After the war he joined 601 (County of London) Sqn, RAuxAF, and was its commanding officer for four years.

Among British exhibits at the Leipzig Trade Fair, now in progress, is a complete constant-frequency AC generating system, including two contant-speed drives and two 40 kVA brushless generators, for a modern airliner. It is displayed by English Electric's Aircraft Equipment Division, who are also showing a new 9kW brushless DC generator. Exhibits by Napier include models of the Eland and Gazelle and—for the first time—a model of the Westland Wiltshire. It may be remembered that Eastern Germany have purchased large quantities of Napier-cast gas-turbine blading.

A Spring and Touring Number is being published today (March 4) by our associated journal *The Autocar*.

***HAWKER SIDDELEY** directors named in the new appointments recorded in these pages. From left to right they are Sir Aubrey Burke, J. A. R. Kay, J. T. Lidbury, A. F. Jopling and A. S. Kennedy*

FLIGHT SYSTEM SURVEY

# That FAA Report on Decca

ON pages 65 and 84 of *Flight* for January 15 reference was made to an inexplicable press release by America's Federal Aviation Agency concerning a report on evaluation of Decca Navigator—a report which, at that time, had yet to be issued. The statement remarked that FAA had tested Decca and found it sadly wanting as an airways aid.

The actual report, now issued, has two sections, one being the main body of the paper entitled *Final Report on the Helicopter Operations Programme*, issued by the FAA Bureau of Research and Development; the other is Supplement No 1, entitled *Operational Test of Mk 10 Decca System in C-131 Fixed-Wing Airplane.*

That part of the report which refers to the helicopter trials was compiled under contract by the Airborne Instruments Laboratory and consists of about 40 pages of discussion and over 200 pages of facts and figures on Decca performance. It seems to be a genuine effort to make an unbiased assessment of the system and, though its conclusions are not altogether the same as those reached by other people, it seems reasonable and honest. As a helicopter aid Decca is, of course, acknowledged and there is virtually no alternative at present available.

New York Airways have already begun a second programme, employing helicopter airline pilots from all over the US, to investigate Decca as a permanent IFR aid. This in itself seems to show that the results of the first trials cannot have been so bad.

A further factor is that NYA have specified dual Mk 8 Decca receivers for their fleet of Vertol 107s. Each installation will include two receivers in ½ATR cases and two Flight Logs to a total weight of about 120lb—equivalent to one passenger and therefore hardly likely to be devoted to useless equipment.

What has caused intense reaction is the supplement, which purports to summarize the reactions of a group of pilots to airways flying with Decca in a Convair C-131. Information was gathered by making each pilot fill in a questionnaire after each flight, answering questions examples of which are listed at right. In fact seven pilots were involved, each flying for some 50hr on four carefully planned routes. Each is claimed to have received 12 or more hours of ground and flight training in Decca operation and in each case the Flight Log chart was retained after the flight. The routes were carefully planned and flown beforehand, but more than half of them were in areas where reliable coverage could not be expected from the New York chain.

Photographs show that the installation was a good one—though not duplicated as VOR normally is—with the Flight Log mounted over the centre of the coaming and the three Decometers set in a sloping roof panel ahead of the co-pilot with each dial tilted to lie normal to the line of vision. Control panels were mounted in the roof immediately aft of the dials.

## Unexpected Results

Many of the Flight Log charts show that track-keeping was in most cases extremely good, but often the nine-mile width of the airway covered less than ¼in on the chart, making track keeping unnecessarily difficult. Track records reproduced in the report are not effectively commented upon. The accuracy of route flying was certainly much better than the remainder of the report leads the reader to believe. Decca engineers flew with the FAA crews on many flights and gained the impression that pilot reaction was favourable. Decca were not shown the report beforehand. In fact, the press release was the first firm intimation of the FAA's poor opinion of the aid. Decca point out that such a procedure is almost unprecedented.

The timing of the report is worth noting. The preliminary press statement was issued (not "leaked" as is often the case) on January 5 and appeared in the daily Press on January 6. The report itself was dated January 15 and was actually issued on about February 6. Such timing would be curious in normal circumstances, but in view of the ICAO background it seems more than fortuitous.

The Decca chain used was that set up some time ago specifically for helicopter trials by New York Airways. It has relatively short base-lines between the master and three slaves and radiates at a power about one-fifth of that of the standard European Decca chains, despite a higher local noise level. Decca freely admit that the range coverage is not sufficient to allow accurate *instrument approaches* to Boston and Washington airfields—and this the report has complained of. Some use was also made of the Quebec chain in Canada. Total flying time involved in the trials was about 360hr.

The questionnaire filled in by pilots after each flight consisted of a series of questions to each of which "yes," "no" or "no comment" answers were required, the final results in the report being given in the form of percentages—taken, remarkably enough, to tenths of one per cent. With seven pilots and 360hr this seems excessive. Moreover, the proportion of "no comments" seems to average about 20 per cent and sometimes is as high as 80 per cent. No explanation is given of what the percentages might specifically indicate.

The report is in fact a subjective one and extreme care in such cases must be taken to avoid phrasing questions in such a way that the answers might be biased. No such precautions appear to have been taken. The questions, as will be seen, are sometimes vague, sometimes almost misleading, so that many of the "no comments" may have come from pilots who did not grasp the significance of the questions.

## Curious Statistics

Here are some sample questions and answers from the C-131 test questionnaires, giving the percentages of answers:—

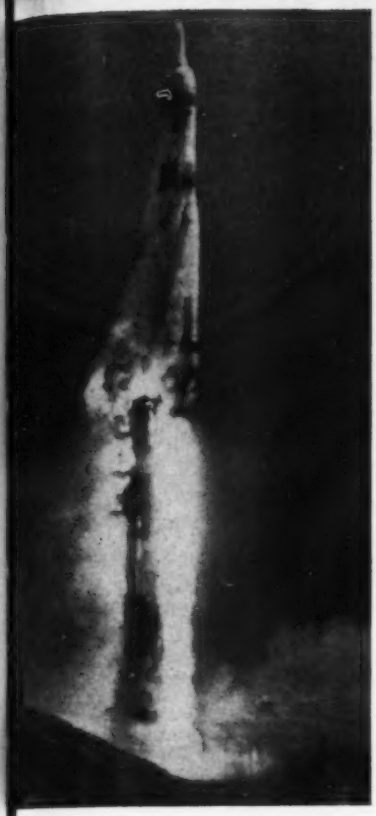
| | Yes | No | No comment |
|---|---|---|---|
| Were there any discrepancies between Decometers and Flight Log after referencing? ... ... ... ... | 23.9 | 64.0 | 12.1 |
| Were there any unaccountable excursions of the Flight Log? | | | |
| (a) During flight? ... ... ... | 52.4 | 35.3 | 12.3 |
| (b) On ground? ... ... ... | 10.0 | 46.5 | 43.5 |
| Did the zone identification work properly? | 47.5 | 36.9 | 15.6 |
| Did the Flight Log require resetting? Present difficulties? When? | | | |
| (a) Entering a Decca area? ... | 28.9 | 21.2 | 49.9 |
| (b) In fringe areas? ... ... | 38.8 | 30.8 | 30.4 |
| (c) In changing charts? ... ... | 47.4 | 28.7 | 23.9 |
| (d) Changing chains? ... ... | 18.2 | 31.4 | 50.4 |
| Were you able to use Decca in an approach? | | | |
| (a) To what field minimum—200ft? | 16.3 | — | 83.7 |
| (b) —500ft? | 12.4 | 1.7 | 85.9 |
| (c) —1,000ft? | 1.9 | 15.8 | 82.3 |
| (d) —above? | 3.8 | 8.9 | 87.3 |
| Were you able to stay within the omni-airway structure (9 n.m.)? ... | 22.5 | 61.6 | 15.9 |
| At any time were you unable to hold in the prescribed holding patterns? ... | 17.5 | 41.8 | 40.7 |
| Were you able to use Decca without resource to another navigational aid? | 24.5 | 49.4 | 26.1 |
| Did you find the initial setting-up of the equipment to be difficult? ... ... | 55.5 | 21.1 | 23.4 |
| At any time did you believe that the Decca equipment was operating improperly? | 39.7 | 34.2 | 26.1 |

Apart from the difficulty of deciding quite what the percentages represent, a number of these questions could better be answered by reference to the Decca operating instructions. In cases where some discrepancy arises there is no indication of how large it was and particularly of whether it materially affected performance. The words "difficult," "believe" and "improperly" are vague. A strange anomaly is the fact that 16.3 per cent of pilots were able to make a simulated instrument approach down to 200ft, but only 1.9 per cent were able to do so down to 1,000ft. Who or what were the over 80 per cent "no comments" in each case? Flight Log resetting is known to be necessary in cases (a), (c) and (d) in the fourth question. In few cases is the point of the question made unequivocally. Readers of both *Flight* and the report may draw their own conclusions. Further detailed comment seems pointless.

It seems that the FAA is not sure that two-thirds of the 21 ICAO-Council nations will in fact support Vortac when they consider it in the near future. Perhaps this uncertainty is the most significant aspect of the whole affair. If the council does not ratify the proposal in favour of Vortac, then the whole problem must be considered again. It can only be hoped that some independent body will then be given the task of making a thorough side-by-side investigation of the two systems in order to produce some answer which everyone may respect. It is certain that until some independent body can make a proper assessment no valid reports will be available. Once the immediate and unavoidable hubbub has died down, everyone would do best to forget this manœuvre and hope for much better things to come. *Flight* for one is heartily sick of having to report this long-drawn-out and unseemly discord.

C. M. L.

# Missiles and Spaceflight



*As noted in the third news-item below, a Titan ICBM has now flown on the power of both first and second stages, with complete guidance and carrying its operational nose-cone. This dramatic photograph shows its departure from Cape Canaveral on February 24. Contributing to the success were Aerojet-General (propulsion), Bell Telephone Laboratories / Remington Rand (guidance), and Avco (ablative nosecone, seen here for the first time)*

### AUSTRALIA TO TRACK MERCURY

Australia and the USA have signed an agreement to extend the co-operative efforts of the two countries in space research. Announced on February 25, the agreement provides for the continued operation of tracking stations established during the IGY and the establishment of new tracking facilities for Project Mercury satellites and deep-space probes. Other Mercury tracking stations are being negotiated in Bermuda, the Canaries, Canton Island, Mexico, Nigeria and Zanzibar. (Tracking and telemetry stations are more closely spaced for Mercury than for any other NASA programme.) For the long-range tracking of space probes, an 85ft diameter radio telescope is to be constructed at Woomera, and NASA hopes to construct another in South Africa.

### GOOD WEEK FOR MARTIN—1

It was announced by Martin's Orlando Division on February 19 that the GAM-83B, the advanced version of Bullpup under development for the USAF, will have a nuclear warhead. The original ASM-N-7 of the US Navy has been in service for about a year. The GAM-83A for the USAF Tactical Air Command, and the corresponding naval N-7A, has a packaged liquid-propellant engine and an improved conventional warhead. It also has a revised electronic guidance package, which will be incorporated in the still-later GAM-83B. The latter will have a variety of nuclear and conventional warheads, which can be rapidly installed in the field.

### GOOD WEEK FOR MARTIN—2

Flight testing of the Titan ICBM is at last making real progress. Developed by Martin's Denver Division, this great missile did not achieve a single successful mission between May 4, 1959, and February 2 last. Although one learns much from any firing (even from a missile that explodes on the pad), one has to achieve reasonable success with a mission sometimes. Notes on Titan's successes and failures were contained in our issues of December 25, January 8 and February 19.

Titan B-7A on January 27 achieved the first stage-separation and second-stage ignition *in vacuo*. On February 24, however, one of the Titan C-series flew a 5,000-mile mission with the new ablative nosecone and dummy warhead, opening a series of extended-range flights designed to test all major subsystems. As the photograph above shows, the new Avco nosecone bears a very strong resemblance to the Mk 3 cone by General Electric, although it doubtless differs in detail. It increases the total height of the missile to approximately 98ft. The cone was fully instrumented and was recovered some 5,000 miles down-range in the South Atlantic.

### GOOD WEEK FOR MARTIN—3

The first Pershing missile to be launched was fired from Cape Canaveral on February 25 at a target 40 miles away in the Atlantic. The test appeared to be successful. In last week's issue (page 268) we published the first photograph of Pershing to be released and described the missile briefly. A selective-range weapon of the US Army, it is intended to replace the Redstone.

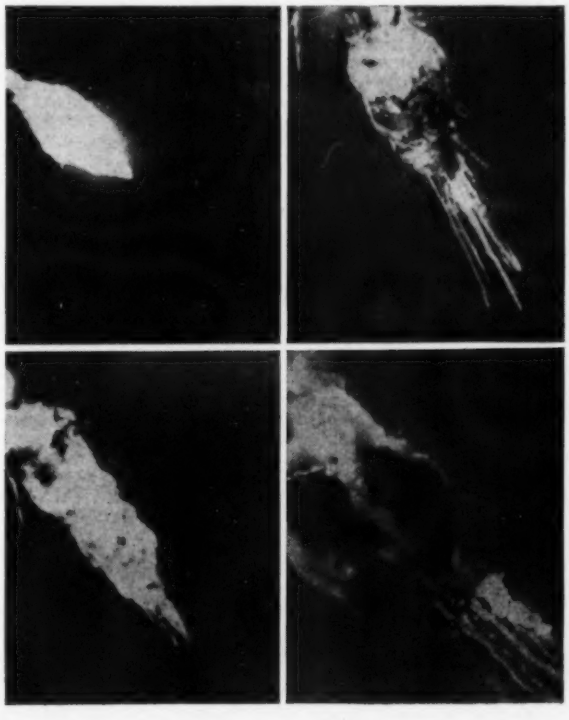
A two-stage, solid-propellant weapon, Pershing is very much smaller than Redstone as a result of improvements in nuclear warheads (facilitating substantial reduction in payload weight) and in the evolution of solid fuels with high specific impulse. Total length of the missile is only 32ft. In the test on February 25 only the first-stage charge was fired, and it burned for 40sec. It is not yet known whether the two stages separated. Shortly after the firing, Martin's Orlando Division, the prime contractor, commented that Pershing's new transporter/erector will enable the missile to be launched "a matter of minutes" after arriving at a site. The statement also confirmed that the weapon has pure-inertial guidance.

### CANADIAN-US SATELLITE DESCRIBED

Details were announced by the National Aeronautics and Space Administration on February 15 of the joint Canadian-American satellite scheduled to be launched next year. The project, to study the ionosphere by means of a sweep frequency topside sounder satellite, will be conducted jointly by the Canadian Defence Research Telecommunications Establishment and by NASA.

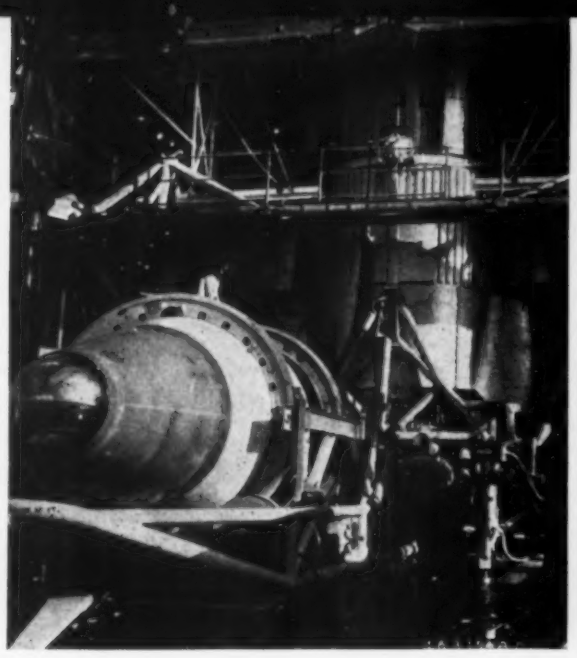
The DRTE will provide the satellite and its instrumentation and will operate a network of receiving stations within Canada for recovering telemetered data. NASA is to provide high-altitude sounding rockets and launching services to test the Canadian satellite prototype instrumentation; the satellite launching vehicle; and launching facilities. NASA will also be responsible for ground-based telemetry and recording apparatus outside Canada for at least one year, and will furnish copies of satellite data recorded outside Canada for exchange with the Dominion.

The experiment is expected to enhance greatly the knowledge of the characteristics of the upper levels of the ionosphere. Existing ground stations are able to obtain information by reflecting radio waves from the bottom side of the ionosphere, i.e., up to about



*The Thor-Agena vehicle carrying the Discoverer 10 satellite was destroyed by radio command from the ground, 56sec after launch, at Vandenberg on February 19. The rocket had swerved off-course and was exploded at 20,000ft*

# *Missiles and Spaceflight . . .*



*The Atlas-Agena rocket intended to place the first experimental Midas (Missile Defense Alarm System) satellite in orbit failed on February 26, when the second stage did not separate and the vehicle fell into the Atlantic 2,500 miles away from its launch site at Cape Canaveral. Right, the Agena second stage, containing both Midas infra-red sensors and Bell engine, prior to mating with Atlas 29D; far right, the ascent just after lift-off*

200 miles, at approximately 140 locations throughout the world. Soundings obtained with the Canadian-US experiment will extend the ground-station data to altitudes of about 700 miles and, in addition, will furnish information for geographical areas which are not covered by the present ground-station network.

The satellite will be launched into a polar orbit, and the principal studies to be made will concern the ionosphere over Canada, the United States and South America. Soundings in the auroral zones will be of particular interest to Canada in relation to special communications problems in high latitudes and arctic regions. It has been reported from Ottawa that a three-stage Thor-Delta vehicle will be used to launch the satellite from Vandenberg Air Force Base, California.

## MORE MONEY FOR NASA

Speaking before the Senate Appropriations Committee on February 23, Dr T. Keith Glennan, Administrator of the National Aeronautics and Space Administration, gave his organization's reasons for requesting a supplementary appropriation of $23m for the 1960 fiscal year, the already-approved sum for which is $500,575,000. Of the amount requested, Dr Glennan said, $19m was needed for Project Mercury and $4m for modifications to Launch Pad 12 at Cape Canaveral to accommodate advanced types of launch vehicles.

The supplementary request consisted of $12.2m under the heading of research and development for Project Mercury, and $10.8m for construction and equipment ($6.8m of which was for Mercury and $4m for the pad). The research and development total was intended to cover "improvements in the Mercury capsule's design, construction and instrumentation," the need for which had arisen as the result of "NASA's rigorous developmental tests and continuing analysis of safety requirements."

The Mercury construction and equipment figure would cover instrumentation and facilities at the 16 Mercury stations, including the Mercury control centre at Cape Canaveral; and facilities at Point Arguello, California (US Navy Pacific Missile Range), and the associated Kauai Island installation in Hawaii. Pad 12 at Cape Canaveral would need considerable ground support equipment to accommodate the Atlas-Agena B, a new umbilical tower, and a repositioning of the working platform.

## AGENA B

Before the end of next year several shots should have been made of the Atlas-Agena B combination, which is the most capable system currently available in the West for placing large payloads in orbit. Agena is the name given by Lockheed's Missiles and Space Division to the integrated second stage evolved from those used in the original Thor-Hustler and Discoverer firings. The complete second stage is placed in orbit and it is powered by a modified version of the Bell Hustler rocket engine.

This engine was originally designed by Bell Aircraft to drive a delivery pod for the Convair B-58 Hustler supersonic bomber. Its gimbal-mounted chamber is fed with RFNA and UDMH (originally the fuel was JP-4 or RP-1). Performance of the current Hustler engine has not been divulged, but since the thrust at sea level on JP-4 fuel is 15,200lb it is likely that using UDMH the thrust will be almost 20,000lb. Tankage in the Agena B has been substantially increased over that in the original vehicle and many refinements have been made.

As now developed, the advanced Hustler is the only Western engine of its size specifically designed for stopping and starting in vacuum conditions. Even at zero ambient pressure, UDMH and RFNA are hypergolic, and extensive testing at Lockheed's facility at Santa Cruz, California, suggests that good control will be achieved and that it should be possible to inject payloads into predetermined orbits with extreme accuracy. The most important task so far assigned to Agena B is the placing in orbit of the two currently programmed US Air Force reconnaissance satellites: Samos, using photographic methods, and Midas, using infra-red systems.

## US ROCKETS FOR SWEDEN

As part of a high-altitude research programme planned by the International Meteorological Institute, Stockholm, a number of Nike rockets are to be purchased by Sweden from the USA. This was stated by Prof Hannes Alfven of Stockholm Institute of Technology on his return to Sweden from a lecture tour in the USA.

It is hoped that the rocket soundings will provide information on the composition of the so-called shining night-clouds which were frequently visible during last summer. It is not known whether these clouds consist of meteoric dust or condensed water vapour. The rockets will also be used by the Kiruna Observatory in Arctic Sweden to measure the ionized radiation connected with the Northern Lights.

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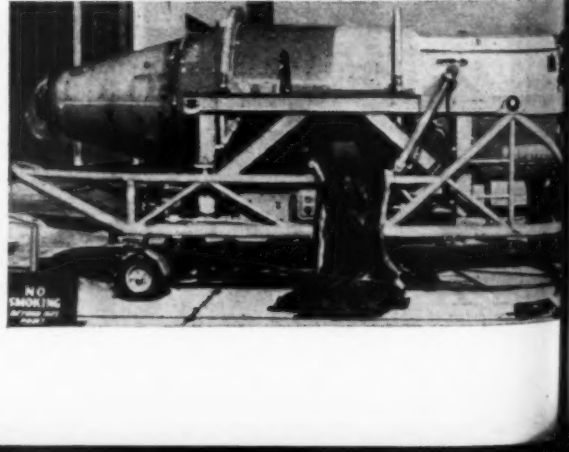
A voice message was reflected from a 100ft aluminized plastic balloon at a height of 250 miles on February 28 in the third in the series of radio-reflector tests in the development of a communications satellite by the US National Aeronautics and Space Administration. A three-stage rocket was used to launch the balloon (in uninflated form) from Wallops Island, Virginia.

PROFAC (propulsive fluid accumulator) is suggested by Northrop Corp as a manned orbital fuelling station. Propelled by a ramjet, it would orbit in the outer layers of the atmosphere, accumulating and storing up to 500,000lb of air in liquid form. The liquid air would then be passed on demand to spacecraft and used for propulsion in a variety of ways. It is calculated that PROFAC could cut the weight of booster required for each pound of payload to be placed on the Moon from 300 to 30lb.

*The Midas-type Agena second stage, weighing two tons, is inspected before the February 26 launch illustrated in the heading photographs. News of an advanced version of Agena is given on this page*



***Missiles and Spaceflight . . .***

# SPACE-WORDS FROM WESTMINSTER

THE main facts arising from the adjournment debate on space research in the House of Commons on February 22 formed a firm statement of what we would do with the satellites which could—"if wished," as Mr Rippon put it—be launched by British rockets in the mid-1960s. The Parliamentary Secretary to the Ministry of Aviation was replying to points raised in a discussion on space research by F. V. Corfield (Gloucestershire South), Geoffrey de Freitas (Lincoln) and George Chetwynd (Stockton-on-Tees).

Mr Corfield, speaking not as a scientist, not because he was "in any way attracted by the idea of space travel," but as a Member for a constituency in which engineering was of paramount importance, asked this question: "Can we, as a nation which relies so enormously on exporting skills rather than materials, afford to restrict our participation in space exploration to the very modest contributions which have been sanctioned to date?"

We neither could nor should attempt to emulate US or Soviet efforts, he continued. We should not be dazzled by their size, nor should we ignore them.

"The position of this country today must depend as much as anything on the pioneering spirit of the past. I do not believe that we can afford to ignore the challenge of the exploration of space to our pioneering spirit of the present. I do not imagine that anyone would seriously suggest that the pioneers of the past—those who opened up the new world and the sea routes to the East, the inventors and scientists—foresaw even a fraction of the wealth and benefit that their endeavours, albeit subsequently, brought to mankind. . . . I believe it would be equally foolish to determine our contribution to space exploration purely on the basis of cost on the one hand or on the commercial benefits which are likely to be derived on the other."

As far as the Western world was concerned, Mr Corfield suggested, co-operation should not be dominated by the United States, whose incentive he believed to be primarily military. He did not want to belittle American generosity in offering space in their satellites for British instruments, nor the value of COSPAR, but the US offer had been extended to all countries and the satellites involved were only small ones.

References to "Britain's lead," whatever the subject under discussion, are all-too-popular in parliamentary debates and, surprisingly enough, Mr Corfield managed to extract one, delicately qualified, in this context. Whatever the future of Blue Streak might be, he said, its development to date, together with the development of Black Knight, "must surely give us a lead over all other nations, other than the United States and Russia, in the ability to place a satellite of our own in orbit." He did not believe that the cost need be "anything like as astronomical" as people made out.

Mr de Freitas weighed in with a relevant question. If Blue Streak and Black Knight were to be launched for development or RAF training in Australia during the next few years, would our scientists be in a position to launch satellites with them? If not, what was the Government doing to put them in that position?

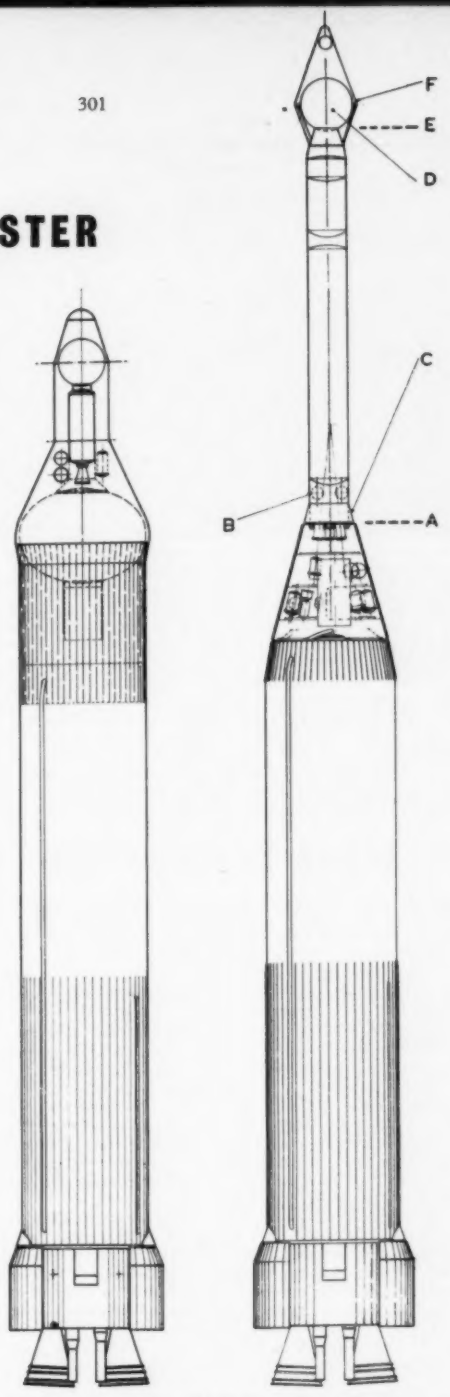
Back to Britain's lead again, with a contribution to the debate by Mr Chetwynd which included the sweeping statement that "We must be in the van of scientific thought and progress upon whatever lines it takes us and at whatever cost." One of the first things that we should like to know, Mr Chetwynd suggested, was whether there was a conflict—a tug-of-war, perhaps—between the scientific advisers of the Minister of Science, and "the practical people in the engineering and productive spheres who perhaps want to get on a little more quickly than the scientific advisers may think possible."

Concerning Blue Streak, if it were not to be the great defence weapon as first envisaged, we had a wonderful opportunity to cut our losses and to get something really worthwhile out of it from a scientific point of view. By analogy with swords into ploughshares, "It may be that we can beat something like a space satellite vehicle out of Blue Streak if it is not to have the military use which was first envisaged."

Towards the end of his speech Mr Chetwynd said, "The engineering capabilities have been stressed. A great electronics industry can be built up which will have tremendous export possibilities for us, as well as the worthwhile pursuit of knowledge for its own sake. We cannot afford to be left out of this search for knowledge." The van-of-scientific-thought reference followed.

The Parliamentary Secretary began his reply by discussing the Skylark upper-atmosphere sounding-rocket programme (described in *Flight* last week), mentioning that "over 20 successful experiments" had been carried out (but omitting to mention that several experiments per firing has often been the rule). Skylark, he said, had certainly proved a relatively cheap and very reliable vehicle and, as for American interest:—

"The House should know that the United States National Aeronautics and Space Administration had made known its interest in purchasing four Skylarks. An invitation is being extended to the Administration's representatives to visit the United Kingdom to discuss precise requirements because each Skylark is, in part, tailor-made to suit the particular experiment that it is expected to undertake. . . "




***The use of Blue Streak and Black Knight as a satellite-launching combination was the prime subject of the Commons debate reported here. Above are shown two types of launching vehicle which might be used: left, Blue Streak, modified Black Knight and solid-propellant third stage; right, Blue Streak and standard Black Knight. These illustrations are from the Blue Streak paper presented by G. K. C. Pardoe at the Commonwealth Spaceflight Symposium held in London last August***
**A, first-stage separation; B, extra HTP equipment for separation and coasting control; C, fairing and support structure; D, payload; E, final separation; F, nosecone ejected in halves at first-stage all-burnt.**

## SPACE-WORDS FROM WESTMINSTER . . .

After referring to Black Knight, Jodrell Bank, the Radio Research Station at Slough and British activities in COSPAR, Mr Rippon outlined the previously announced plan for joint Anglo-American satellites. The exact number in this series, he said, had yet to be determined (three are in immediate prospect, according to a recent statement by Prof H. W. S. Massey). The "second potentially most important" aspect of our programme arose out of the design studies for the adaptation of British military rockets for possible future all-British satellite programmes: this work was well in hand and "the information to date is favourable to the project" (a phrase reported and commented on in *Flight* some ten days earlier). There followed the first official details of what was in mind for the "possible future all-British satellites."

"I can assure the hon Member for Stockton-on-Tees that there is no tug-of-war, as he called it, between one branch of the Government and another. We cannot . . . undertake our own independent space research programme until we have first completed the development of our own ballistic rocket. What I can tell the hon Member for Lincoln is that what is certain is that the combination of Blue Streak and Black Knight with a small additional rocket stage which, I understand, presents no great technical difficulties could, if wished, provide the thrust necessary to put in orbit by the mid-1960s a space stabilized satellite of between 1,000 and 2,000lb in a near-circular orbit of between 200 and 300 miles' altitude. It would provide a platform for astronomical observation unimpeded by the Earth's atmosphere. . . .

"We are also investigating the feasibility of two other classes of satellite. First, a non-stabilized instrumentation package of some few hundred pounds' weight in an orbit of maximum height of between 8,000 to 12,000 miles. The primary purpose of such a satellite will be to investigate the constitution of the Earth's atmosphere and its radiation and magnetic fields. Secondly, a smaller unestablished instrumentation package of about 50lb weight in an orbit with a maximum height of 100,000 miles, primarily to investigate the properties of the Sun's atmosphere."

The Parliamentary Secretary went on to amplify the three broad fields of interest. Firstly, the possibility of an astronomical observatory (forecast in *Flight* of February 12), looking outwards from the Earth from a position outside the atmosphere. "That would make available for the first time many octaves of ultra-violet and infra-red radiation which would provide entirely new solar and stellar data"—and this was comparable in importance to the development of radio astronomy.

Secondly, the possibility of a terrestrial observatory for looking down at the Earth, able to make worldwide meteorological and geophysical observations and leading to "greatly improved" weather forecasting. Thirdly, there was the possibility of direct physical measurement of the extra-territorial atmosphere, an example of which was the discovery of the Van Allen radiation belt.

In an incidental aside on the subject of weather, Mr Rippon recalled that a new Assistant Directorate had recently been established in the Meteorological Office for the study of the upper atmosphere. "It is hoped that it will be possible," he said, to make frequent launchings of sounding rockets: as for meteorological satellites, "the possibility will be explored."

It was generally agreed, the Parliamentary Secretary said, that in considering space research we had to count the cost. The best answer to Mr de Freitas was that given in the recent annual report of the Advisory Council on Scientific Policy—that when the design studies on the adaptation of British rockets were available, it would be possible to decide whether the additional expenditure and diversion of effort involved (in a purely British satellite programme) would be justified by the expected results. "It may be premature to make final decisions on these matters," he added, "before we have further results from the design studies."

As Lord Hailsham had indicated, Mr Rippon concluded, the position was that we intended to ensure that, "if and when a rocket is available, and should Parliament agree and the Cabinet so decide, our design studies will be available to modify that rocket for space research."

K. T. O.

# SPACE EXPLORATION: PRIVILEGE AND RESPONSIBILITY

A WARNING of the dangers of the contamination of planets such as Mars and Venus by space vehicles was given by Prof A. C. B. Lovell, professor of radio astronomy at Manchester University and director of the Jodrell Bank experimental station, in London on February 24. Prof Lovell was presenting the Trueman Wood lecture on *The Exploration of Outer Space* before the Royal Society of Arts.

Speaking of the search for extra-terrestrial life, the lecturer said: "The planets Mars and Venus are crucial in respect of any biological investigation. Their physical conditions and environment would not seem to be necessarily prejudicial to some forms of biological development, and indeed the presence of plant life on Mars is strongly suspected from recent spectroscopic studies. Instrumented probes will soon approach these planets—indeed the American probe intended to be placed in orbit around Venus was postponed in June 1959 because of time-scale difficulties only and not because of lack of capability.

"There are at least two crucial biological experiments now under development which will be carried in these future probes. One is an infra-red spectrometer sensitive in the region of a few microns. If this instrument can be placed even within a few tens of thousands of miles of the planets it will be able to investigate the spectral regions where molecules of biological origin have very definite characteristics. The other is a microscope with an automatic collecting device which will feed it with samples of the planetary atmosphere (or surface, when a soft landing can be made). . . .

"It is sometimes difficult to comprehend the excitement and gravity of the excursion of deep space probes to the nearer planets which will soon be launched by the American and Russian scientists. No human being can fail to be elevated by the thought that we are privileged to live in this age which has achieved the potential to investigate the existence of extra-terrestrial life.

"On the other hand, this privilege carries with it a most grave responsibility. Unless the utmost care is exercised these space vehicles may well contaminate the planets and their atmospheres with macromolecules which have developed on Earth. The intentional or accidental excursion of a probe into the environment of Mars or Venus before the biological instruments are ready might destroy for ever the validity of the biological investigations and might, indeed, divert or destroy the evolutionary processes already at work in these domains. Two great powers are on the verge of these experiments and it is the scientific and moral duty of all concerned to see that no aspects of chauvinism lead to this disaster."

Early experiments with Earth satellites and space probes, Prof Lovell said, had yielded a remarkable discovery which was revolutionizing our beliefs about the major geophysical phenomena. Further, they had destroyed the belief that the Earth's physical environment extended only to a few hundred miles—the major influences of this environment were now set at about 60,000 to 70,000km, or about ten Earth radii, and it was beyond these regions that outer space could really be said to begin. Following the discovery of the Earth's radiation belts it was reasonable to assume that the planets also would have similar belts.

One concept soon to be tested, by means of instruments carried in an American deep space probe to be launched towards the Sun, was that of the "solar wind"—the continual outward flow of the material comprising the Sun's atmosphere, or corona, enveloping the Earth and other planets. The refinement of the micrometeorite measurements by space probes and satellites, also, coupled with further development in the ground-based photographic and radio echo meteor work, would certainly lead to a much better understanding of the role of these particles in the formation and evolution of the solar system.

Prof Lovell concluded: "I have chosen to speak about some aspects of the exploration of outer space because they interest me and because my daily life is wrapped up in some of the problems involved. Under these circumstances I know that it is easy to gain an exaggerated view of the importance and interest of the subject and, indeed, to become too optimistic about the possibility of reaching solutions to problems which have faced Man for all time. Even so, in spite of the hazards of the world today, it does seem that we live in a privileged epoch in which Man has achieved supremacy over great technical barriers so that we are enabled to explore two issues of tremendous importance to humanity, with bearings on the uniqueness of life and the origin of the universe.

"Occasionally, people with a mundane view of existence ask why it is necessary to do such work. In this case we can only respond in kind, and point out that nearly all the technical devices on which the cultural and economic strength of the great powers is based can be traced back within a few decades to fundamental scientific research supported and carried out without expectation of (or, indeed, interest in) practical benefits.

"However, it is an innocent mind which does not see how the space probes and the radio telescopes have emerged from the cataclysm of war, and that today they remain close relations of the defensive devices of nations. The danger, as I see it, is not that the aspects of research which I have discussed will lack support, but that they will be supported extravagantly for the wrong purpose. The devices of the scientist who is concerned with the exploration of outer space are double-edged. It would be an inconceivable disaster if they are built up and organized in such a way that they can too readily be switched in support of national jingoism at this crucial moment of inquiry into the fundamental nature of life and the universe."

# The Price Pioneers

TREK AIRWAYS' DC-4s OPERATE VERY-LOW-FARE SERVICES FROM SOUTH AFRICA TO EUROPE

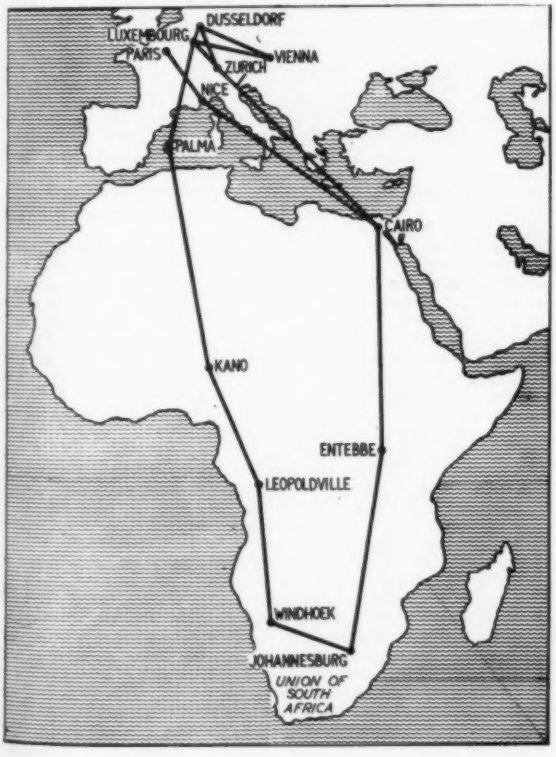
BY JOHN CORMAC

IF one thing is certain in the controversial history of air transport it is that the impetus for cheaper fares has usually come from the small, so-called "independents." If left to themselves, the large scheduled carriers tend to indulge in a frenzy of quality competition which drives up costs—or, to be precise, prevents costs from being reduced to the extent which aerodynamic science would otherwise allow—and this in turn has made them reluctant to cut fares.

This is, of course, not because the world's leading airlines are selfish monsters, more keen on conforming to Parkinson's Law than on bringing air transport to the masses, but because these carriers are the victims of an environment where prestige, political opportunism and nationalism are given precedence over economics.

Fortunately for the travelling public, the activities of small, privately owned companies have always forced their bigger brothers to look towards their cost levels: they are only too aware that, at the least, they will be made to look ridiculous, and at worst they will start to lose traffic.

The most publicized battle between regulars and independents was that concerning the $99 fare between New York and California. The battle finished with the regulars adopting the new low fare—and in the event doing very well out of it—while the licensing authority virtually forced the "ninety-niners" out of the business. But the route over which war has been waged for the longest time is undoubtedly that between South Africa and Europe; steadily over the past 15 years "the establishment" has been faced with competition from small, privately owned carriers who have been happy to carry people for some 6,000 miles for £100 or thereabouts.




The years between 1945 and 1953 were marked by great confusion: small companies sprang up, and then disappeared, almost overnight (see *Flight*, September 12, 1958, for a brief account of this period). Legal suits, liquidations and sharp practices were the order of the day. But subsequently—since December 1953 to be precise—a new and dynamic element has entered the scene in the form of Trek Airways.

Judged against the standards set by the international giants, Trek is a small company; their fleet comprises but two DC-4s; their annual revenue amounts to only about £$\frac{3}{4}$ million; and their staff number few over 100. Yet in a world which pays such blind lip-service to sheer size, it is important to bear in mind that the efficient small operator can offer something which the large airline is usually denied. Three advantages in particular tend to be enjoyed by operators such as Trek: (a) low costs; (b) personal attention; (c) staff enthusiasm.

At the same time the small international operator faces a number of extreme problems. Particularly difficult, especially in the case of Trek Airways, is the securing of traffic rights. The only consolation resulting from a severe restriction on the number of flights is an easing of the sales problem; demand for seats is so strong that services are wait-listed for nine months ahead.

But this sort of thing is not evident only from dreary booking statistics; anybody going to Jan Smuts International airport at Johannesburg can see it with his own eyes. The writer himself counted 62 passengers filing out of an incoming Trek DC-4 on an afternoon in early December—the alleged "trough" season. He could not help noticing that this was greater than the combined traffic for three flights from Europe operated into Johannesburg by well known IATA airlines on that same day. With this sort of thing happening regularly, the locals now presume a large crowd of people on the airport's observation platform to be a sign of a Trek flight.

It is not merely large loads which draw the crowds to Jan Smuts: it is also a reflection on the type of people who choose to fly by Trek. With but few exceptions, these are paying for their fare out of their own pockets, are travelling either on holiday or to visit friends, and are therefore likely to be met or seen off at the airport. This contrasts with the type of passenger found on the more expensive, faster services operated between Europe and South Africa by the larger IATA carriers: these are predominantly expense-account travellers who make their way unaccompanied to the more expensive hotels in the city centre. Needless to say, the majority of these passengers are men. In strong contrast, almost two-thirds of Trek's passengers are women or children.

Something like two-thirds of Trek's total traffic also happens to originate in South Africa. Most of the rest originate in Germany, although a sprinkling will have made their booking in Britain, Holland, Switzerland, Austria or Italy. In the airline's early days a high proportion of passengers were immigrants travelling on a one-way ticket; today this class of passenger accounts for less than 10 per cent of the total. Another striking feature of Trek traffic is that in spite of the fact that the large majority of passengers originate in the Union only a few travel on South African passports. This paradox is no more than evidence that many of Trek's passengers are "new South Africans," who have not yet adopted South African nationality

*Trek operate two sparklingly clean DC-4s which had formerly flown for eleven years with Northwest Airlines. Their history was noted in "Flight" for August 14, 1959*

## The Price Pioneers . . .

and who are returning to visit their fatherland. A final important characteristic of the traffic is that well over 90 per cent of the passengers are flying for the first time.

Although an outsider would be tempted to believe that this airline's long waiting lists are the result of low fares, the company's own investigations have shown that a surprisingly large proportion of people—perhaps as much as 50 per cent—are attracted primarily by the type of service offered. The most characteristic feature of this service is the night-stopping, in each case at places which have considerable touristic value. Flights passing through East Africa have night-stops at Entebbe, Cairo, and—as alternate points in Europe—Malta, Zurich or Vienna. On the West African route, overnight stops are effected at Leopoldville, Kano, and Palma, Majorca.

All services originate at Jan Smuts and terminate at Dusseldorf or, less frequently, Luxembourg. Each round flight is programmed to take nine days; although this gives the aircraft a fairly lazy time, a faster schedule would either require a slip crew to be placed along the line or a third pilot to be carried on board. In any case there are two further reasons why a more strenuous schedule should be avoided. The first is that a little elasticity in the system is a good thing when one is operating five 12,000-mile flights a month with two aircraft. But most important of all is the passengers' decided preference for leisurely travel. Although there are only a few hours available at each night-stop for sight-seeing, each of these hours is precious when it can be spent at interesting places which may never be visited again. Also, accommodation is provided at the very best hotels —the Phoenicia at Malta, the Bahia Palace at Palma, and the Nile Hilton at Cairo for instance. To many tourists a short sojourn at such hostelries is itself of real value.

Passengers also enjoy the excellent in-flight service offered. Unlike many so-called "coach" services, Trek aircraft are fitted with fully reclining seats—"fully" in this case being completely justified for the seats can be lowered to a nearly horizontal position. Equally important, there is none of this 34in nonsense about seat pitch: on these aircraft there is a generous 40in between each row of seats, a pitch equivalent to most first-class services. Neither is there anything coach-class about the catering, for first-class meals are the order of the day.

In addition to these purely material considerations, there is another ingredient of Trek service which has made the airline many friends: they really succeed in striking a human note. When things go wrong—as inevitably they must on occasion—the captain or senior stewardess will take passengers completely into the aifline's confidence. At the other extreme, such occasions as crossing the equator are taken as an opportunity for some harmless horse-play. But some of the tricks which the crew keep up their sleeves to brighten the journey for passengers are so novel that to describe them in the pages of *Flight* would be like deliberately infringing the patent law. There is no doubt that a conscious effort to create a friendly atmosphere on board can be very successful—and the measure of success is the number of people who by the end of the 3½-day journey find themselves sitting in seats other than those in which their journey began.

To the hardened air traveller, accustomed to selecting only the latest types of aircraft, the DC-4 might seem an uncomfortable proposition. Yet the writer must honestly record that Viscount travel in South Africa and in Europe, in each case after some 30hr in the DC-4, proved only slightly better in terms of vibration and, curiously enough, slightly inferior in terms of cabin noise. Of course, the main objection usually levelled at non-pressurized aircraft is inability to over-fly rough weather. This is a weakness which cannot be denied: flying conditions over the Sahara in the northern summer and over the Rhodesias about Christmas time can be pretty turbulent. It is possible, however, to alleviate this difficulty or avoid it altogether by starting early in the morning and thus completing the day's flying before bumpiness sets in; by throttling well back whenever conditions get rough; and by being prepared to make considerable detours to dodge any trouble spots.

But there is another side to this particular coin: by flying relatively low one is certainly given a view of the countryside which is denied to the person travelling at 20,000ft-plus. Flying this way, the world below is not a cloud-specked grey-green carpet but a place of infinite interest and variety. The experience of seeing with one's own eyes the variation of landscape which lies between Windhoek, Kano and the Mediterranean—even within the barren confines of the Sahara Desert—is something of rare value. On the East Coast route, the Nile temples, native villages, and the occasional herd of elephant are all things which more than compensate for the occasional threat of turbulence. As and when Trek replace their DC-4s with more modern aircraft it will not be through a desire to fly their passengers higher but rather to permit night-stops to be reached earlier by dint of greater speed.

Perhaps it should be added that the company's two aircraft are no ordinary DC-4s. In the first place, these machines are unusual in that they are not converted C-54s but are among the few that were built immediately after the war specifically as civil airliners. Secondly, they were finished to the specifications of one of the world's most selective airlines—Northwest Orient. And after ten years with this carrier they probably emerged as about the best maintained of any DC-4s anywhere. Thirdly, they were built for long-distance, overwater operations; instead of the normal tankage of 3,000gal they take 3,600gal. This allows the avoidance of costly, and sometimes uncomfortable, landings for refuelling. And finally, Trek have maintained the aircraft in immaculate condition since they took them over. This attention is superficially apparent from the outside appearance of each of these aircraft: the exterior literally sparkles like a jewel in the sun, while the interior is always spotlessly cleaned and laundered.

*Entertaining the children*

But of greater significance is the thorough manner in which the DC-4s are maintained technically. There are two overpowering reasons why the management places the highest priority on first-class engineering. Following the dubious record of many of the company's predecessors, Trek realized that public—and official—support would not be easily forthcoming until the airline was established firmly as a reliable and safe operator. For this reason the company is proud of an unblemished safety record now stretching over more than six years. The other factor which necessitates the highest engineering standards is the type of operation involved. Purely from a cost point of view, the company cannot afford to see one of their aircraft go unserviceable *en route*. Testimony to their success at eliminating mechanical breakdowns is the fact that in over two years' operation with DC-4s the airline has had only one case of a premature engine removal—and that was subsequently found to have been caused by a false alarm.

An important factor in achieving this high standard was certainly the original selection of aircraft. The first step in making a choice was to eliminate all types which were not fully proved, particularly in long-distance flying under extreme conditions. The second was to discard those types which were not already in widespread operation throughout Africa and Europe; to the small airline, ready availability of spares and of trained engineers is of the utmost importance. The type having been chosen, the final step was to comb the world to find really top-notch models. After an extensive tour, the technical director and the chief engineer finished up in Minnesota, headquarters of Northwest

Orient, and arranged the purchase of two of their DC-4s, plus several Pratt and Whitney R.2000 spare engines, and a large supply of spares.

All airframe maintenance has always been done at the company's engineering base at Germiston (a town lying about 12 miles to the east of Johannesburg). Instruments are overhauled by an associated company, also in Germiston. During the first months of operation with DC-4s, engine overhaul was done by a well-known European airline on a powerplant-replacement basis. This involved a considerable amount of ferry flying. Trek then decided to accept an increasing responsibility for engine overhaul, and the present position is that the work is done by Field Aircraft Services at their plant adjoining the airline's engineering base, while the spares are provided by Trek. The airline is also responsible for inspection. The Department of Transport has now authorized an engine life of 1,800hr—a rate which few DC-4 operators anywhere exceed. Further evidence of official approval of the engineering set-up is the regular award of overhaul contracts by the SAAF to Trek.

Another factor which contributes materially to the airline's record of serviceability is their general operating technique: "think of engines as people," they say; "treat them well and they will treat you well." For this reason they have developed a system which aims at lightening the burden placed on their engines at all times. Captains are generally instructed, for instance, to throttle back to 2,140 r.p.m. immediately after levelling off at a cruising airspeed of 130kt minimum. As airspeed then increases, the rule is to throttle back gradually to the normal cruise setting of 2,050 r.p.m.—a figure which lies well below that suggested by the manufacturer.

Fuel management is, indeed, a fundamental aspect of Trek thinking, and for this reason the statistics showing air-miles per gallon are watched with a hawk eye by the operations director. In the days when the company operated Vikings, British airlines found it difficult to believe that it was possible for them to fly regularly with this type with up to 30 passengers non-stop from N'Dola to Johannesburg, allowing a two-hour fuel reserve. And yet, by cunning fuel management, this is what Trek managed to do. A Viking technique which they now apply successfully to the DC-4 when conditions permit is to throttle right back to 1,600 r.p.m. for a long, gradual descent. The economics of weak-mixture cruising have also been closely studied—and

***Passengers, map and captain***

applied. Fuel costs are further saved by giving captains every assistance and encouragement in effecting maximum pick-ups at points where fuel prices are low; at points where prices are high they restrict the gallonage to the minimum that is compatible with operating requirements.

This close awareness of crew members with operating costs is facilitated by the system of financial control that the airline has evolved. All expenses incurred *en route* are paid for by the captain with traveller's cheques. At first sight this seems a cumbersome method but in practice it has been found to provide a day-to-day control over expenditure which no system of credit will allow. When Trek started operations with a single DC-3 their credit was such that their fuel had to be paid for on a pre-flight basis. Although the company could today draw upon substantial credit facilities, they still prefer to obtain a fuel carnet worth some £2,000 for each round flight; only by doing this is the captain really placed in a position to appreciate the significance of scientific fuel management. Similarly, a control can be exerted over accommodation and catering expenses which is difficult and costly to apply months after the event. After all, the airline business is no different from any other: a credit account allows all manner of opportunity for a wily creditor to have second thoughts.

This strict control of *en route* expenditure is certainly a fundamental reason for the company's low overall cost-level. Despite the high rate of expenditure on passenger accommodation, the airline manages to hold its total costs down to about 30 pence per capacity-ton-mile. Many regular carriers are wont to attribute such low cost-levels to the fact that Independents, unlike themselves, do not have to shoulder heavy obsolescence charges. In the case of Trek Airways this argument holds no water whatever: for the record, they depreciate their aircraft over *three* years, and this gives them a unit cost for this item of fourpence per c.t.-m. This corresponds exactly to the equivalent figure for BOAC and is considerably higher than that for BEA.

There is no doubt that these low cost-levels are due to close financial control, together with high staff-productivity. It is easy to provide a superficial reason why Trek should get such good service out of its employees—it is simply because they enjoy working for this airline. It is no coincidence that the staff are well treated: pay is high (skippers, for instance, get a basic pay that ranges upwards from £3,000 a year); generous health and superannuation schemes are available; there are plenty of holidays —most staff get a month a year; and there is a liberal bonus scheme that is worked out on a sliding scale that gives an average of three weeks' extra pay in a year.

Another factor which certainly affects morale favourably is the degree to which Trek is a family firm, not in the sense that it is run by a single family but in the way that a large proportion of the staff have relatives working for or with them. A third factor, rare in larger organizations, is the almost complete absence of unnecessary formality and "bull." Finally, every possible opportunity is taken to delegate responsibility; this undoubtedly provides staff with an incentive which would otherwise be lacking. The interplay of these various factors is such that staff are prepared to work with an enthusiasm which many other airlines must envy. Stewardesses work as receptionists, or even as telephonists, between flights. First officers are responsible for supervision of baggage in addition to their usual flight duties, and between flights they handle such diverse tasks as completion of monthly flight returns, Link training, instruction, and manning the company's own radio station (this allows continuous contact to be maintained with the aircraft throughout the African continent and is useful not only for technical and commercial advice but also as an aid for passengers in such small but useful ways as allowing head office to be informed about on-booking requirements). Neither are the captains reluctant to accept extra-mural responsibilities; two are active directors of the company and another two are in charge of crew training. This approach all adds up to one thing: here is an airline that carries no fat. And this means low costs.

Yet it is precisely this question of cost that represents Trek's biggest problem in the years immediately ahead. Given present aircraft types there is little scope for further cost cutting: the only item which could be reduced is passenger accommodation (this could be done by cutting the journey time from three and a half to three days). But even then the overall cost level would not fall much below the 30 pence per c.t.-m. mark. The problem is that in a few years' time the leading scheduled carriers, by dint of employing highly productive modern aircraft, will also have reduced their costs to about this level. The first breath of this competition will be felt this summer, when BOAC and South African Airways introduce economy-class fares on the routes between the Union and Europe.

Trek have no doubt that permission to operate up-to-date equipment would allow them to offer either much reduced fares or much improved standards of service (in particular, more time at night-stops). In either case they could with justification claim that their market would continue to differ from that in which the IATA airlines find the bulk of their traffic. And yet, despite the fact that Trek would continue to carry passengers who would otherwise never have known air travel, any application they make for additional rights will no doubt be resisted. From the long-term viewpoint of the consumer, however, the value of independent companies such as Trek Airways lies in their uninhibited effort to bring down the cost of air travel. Remove this stimulus and the airline industry will be left a poorer thing.

***This is what a 100 per cent load factor looks like***

# Australia's First-flight Anniversary

## THE FIFTIETH BIRTHDAY OF POWERED FLIGHT IN THE COMMONWEALTH

MARCH 1 was the fiftieth anniversary of powered flight in Australia, the occasion being the flight at Digger's Rest by the "escapologist" Harry Houdini. Touring the Australian theatre circuit, the magician had brought with him a Voisin with the express intention of being first to fly in Australia.

His claim is debated in Australia, as Lord Brabazon's claims are discussed in England, for Colin Defries had made a brief hop in a Wright biplane in the Victoria Park Racecourse, near Sydney, on December 9, 1909. Houdini's flight was a controlled and steady manœuvre of a full minute, and most people give him the credit. The argument is deepened by geography, for Digger's Rest is near Melbourne.

There was considerable competition for the honour. It is often forgotten now that Lawrence Hargrave, the pioneer theoretician of aeronautics in Australia, might well have beaten the Wright Brothers into the air. In 1900 Hargrave discussed with Sir Henry Barraclough, then Professor of Engineering at Sydney University, the possibility of making a powered aeroplane. Hargrave had, of course, an international reputation for his experiments in the 1890s with aerofoils, his development of the box-kite, and his invention of the rotary engine. He discussed with Barraclough the idea of building a full-size rotary engine (he had previously made models only) to install in one of his large box-kites. He had already proved the lifting power of the box-kite when he had raised himself 16ft by means of a rope attached to four of them. The total weight of the kites had been 34lb 13oz, while the payload, including Hargrave, had been 208lb —probably an all-time record for the ratio! That had been at Stanwell Park, near Sydney, on November 12, 1894. Even had Hargrave been delayed until 1904, he would certainly have flown before the Canadian, McCurdy, who was first to fly in what was then known as the British Empire. But he could not raise the money. Santos Dumont did almost exactly what Hargrave planned when he joined two box-kites and a crude engine.

### George Taylor's Efforts

Hargrave's chief assistant in the 1890s was the Sydney engineer George A. Taylor, who in 1908 opened a factory to produce box-kites of the Hargrave type. Taylor flew one of these at Narrabeen Beach, near Sydney, and other flights were made by Hargrave and by Mrs Taylor, the first Australian woman to make a flight in a mechanical device. These flights were the first "glider"-type flights made in Australia. Wing-span of this machine was 28ft, weight 128lb.

Taylor then joined the Intelligence Corps of the Commonwealth Military Forces, which backed him in building a biplane glider 28ft long and weighing 102lb. Taylor made 29 flights in one day at Narrabeen Beach, December 5, 1909. The aircraft was stable and well controlled and Taylor always considered it to be the first glider in the world to be flown from point to point with precision. One flight of 280ft was made from sandhills.

Meanwhile Taylor had formed the Aerial League of Australia, which prodded the Commonwealth Government into putting up £5,000 as a prize for the first flyable machine made in Australia. In the end the money was never paid, as—it is said—the first machines did not answer the specifications. Taylor decided to win the prize. He built to his own design an engine weighing 60lb and developing 20 h.p., but when installed in the airframe it proved defective. L. R. Jones, an able Sydney engineer, also tried, designing an aircraft based on the imported blue-prints of a Blériot. He designed and built, too, a 30 h.p. steam turbine powerplant. When he was almost ready a storm wrecked everything.

In December 1909, Colin Defries, backed by the theatrical firm of J. & N. Tait, imported a Wright biplane to appear at a "flying fortnight" at Victoria Park racecourse, near Sydney. His three first attempts on December 4 provided two lots of damage but no flight. The aircraft had to be towed into the air by a car and it twice hit the fence. The crowd, paying 2s 6d a head, returned on December 9 to see the half-ton of Wright biplane leave the ground for 5½sec and travel 115 yards. Defries made another attempt on December 18, but crashed.

As in England, one is in a dilemma to be fair. Was this brief hop the first powered flight, or was the better flight, the real flight by Houdini, the first? Most people would give the laurels to Houdini. When he arrived at Digger's Rest to erect his tent in the paddocks there, he found a rival in the American pilot Ralph Banks, who had imported a Wright. On the morning of March 1, Banks took off at dawn, eager to be first, but a gust of wind caused him to crash. Houdini, whose mechanic, Brassac, was a shrewd Frenchman, awaited a steady breeze before starting at 8 a.m. He made a faultless take-off and landing, staying up for one minute. On March 4 he went up again, this time for 7½min and reaching an altitude of 100ft. He made subsequent flights at Rose Hill, near Sydney, before leaving Australia.

Houdini had invited Hargrave to travel from Sydney to witness the flight, but Hargrave in an unusual display of pique (for he was a man of fine character) refused, saying that he had invented the Voisin. In a sense this was correct, for the Voisin was more or less a box-kite.

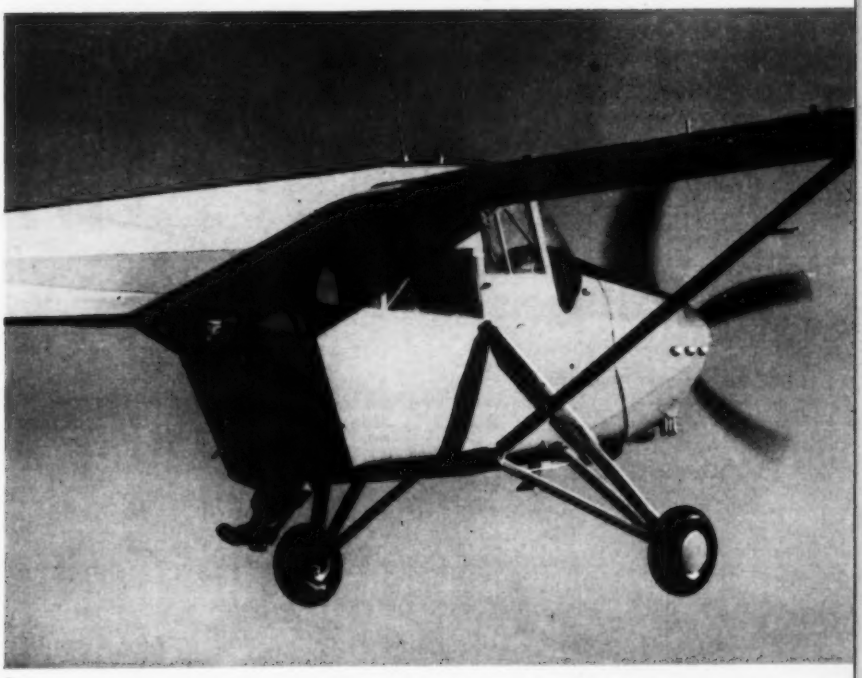
### Involuntary Pioneer

Curiously, the first Australian to make a proper flight did so in a French aircraft also; except for Defries' Wright the first flights were all made in French aircraft. An Adelaide businessman, F. H. Jones, had been in France when Louis Blériot had flown the Channel and he brought back a Blériot monoplane, costing £1,000. Two young Adelaide mechanics, Wittber and Custance, promised to help him in return for flying. They erected the monoplane in a paddock at Bolovar, near Adelaide. The first tests were made by Wittber on March 14, 1910, in gusty weather. He was making one when a strong gust threw the Blériot into the air. He could not get down fast enough! They did not regard this as a flight, though Defries would have done so. Their real flying began when Custance took off on March 17 and stayed up for 5½min. The duration of this flight was due to the fact he was too scared to attempt a landing (all the three of them had to go on was a book of instructions which came with the aeroplane; Jones had never flown and the two lads had never even seen an aircraft before). Custance crashed the aircraft in landing, but escaped. Quick repairs were made, but while the engine was being tested a boy walked into the propeller. He was not killed, but was badly injured. Jones was so upset he locked the Blériot in a shed, where it was destroyed by fire. Custance's flight is almost unknown outside South Australia, but he was the first native son to make a proper powered flight.

The only one of these pioneers to become a well-known figure in Australia was John Duigan, the Victorian who built and flew the first home-grown aeroplane. He had studied engineering in London, where he had seen photographs of Curtiss' aircraft. When he returned to his father's sheep station at Spring Plains, Mia Mia, 80 miles from Melbourne, he set about designing his own aircraft from photographs, using the theory outlined in Maxim's *Natural and Artificial Flight*. He never saw an actual aircraft until his own was completed. He had to do everything for himself, including making his own tools. He was lucky in finding a Melbourne engineer who built him an engine, that, surprisingly enough, was efficient. This aircraft made a brief hop of about 200ft, on July 16, 1910, but Duigan achieved longer flights during the following months. The aeroplane is today preserved in the Melbourne Museum.

STANLEY BROGDEN

*Fifty years on: typifying the up-to-dateness of Australian aviation today: seen on the apron at Essendon, Melbourne, are an Electra of Ansett-ANA (tail visible at left), and a Viscount and Friendship of TAA*



# PARACHUTE PROSPECTOR

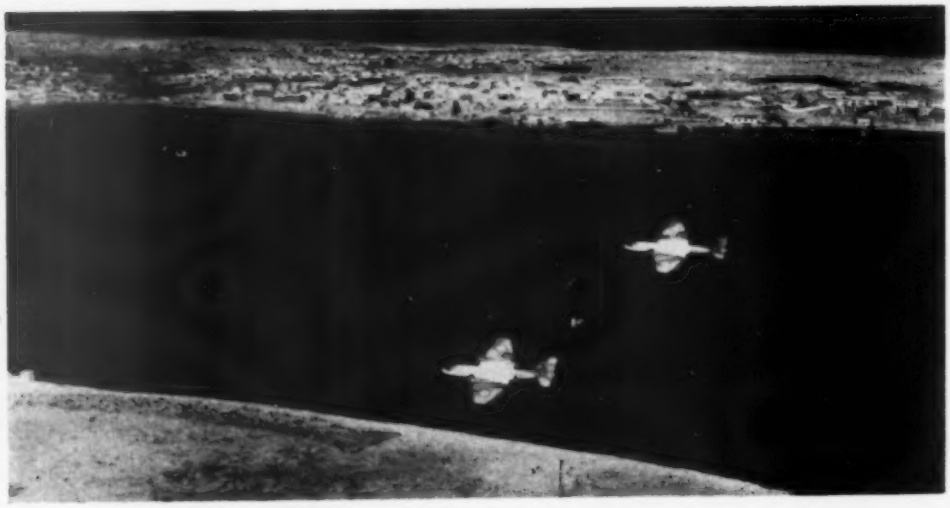
ENTHUSIASTIC volunteers from the Free Fall Club of the 23rd SAS Regt, TA, recently proved the "parachutability" of the Lancashire Aircraft Company's Prospector. Taken at and over Thruxton Airfield by *Flight* photographer Ian Macdonald, the pictures on this page show the Army parachutists being briefed on the exit technique by Mike Reilly, Ripcord Club instructor, and the Earl of Bective, Prospector sales manager; one of the men waiting at the open rear hatch to jump; and another falling away in the classic swallow-dive, free-fall attitude.

Clearance for parachuting from the Prospector was received some time ago but these were the first military trials. They were completed shortly before the demonstrator, G-APWX, was to depart on an extensive African sales tour. Altogether 22 Prospectors have been sold in Europe and farther afield; and the Lancashire Aircraft Co—which took over the business from Edgar Percival Aircraft—has now begun to produce aircraft made entirely at Samlesbury. The new 295 h.p. Lycoming engine and three-blade propeller have significantly enhanced performance and an intensive sales programme is under way; the company is keeping production at six aircraft ahead of orders in order to ensure rapid delivery. In price, performance capabilities and maintenance requirements the Prospector is an attractive aircraft and should find a ready market.

"FLIGHT" PHOTOGRAPHS

# "SWIFTER"

## RAF INVESTIGATE LOW-LEVEL TURBULENCE



AS recorded ...ary 15, ... has been f... the e... on aircraft st... w. The ... near Tobruk, ... name ... series of tri...cing c... Commander-i... at Air ... Electric Canb... Avons) ... flights of abou...ion are ... 600ft by day a...d and ... trials will last ...a thous...

The three p... show ... —a swift ag... ground, ... Canberras ov...r; and ... that most of ... the ce... one of the C... into a ... right Wg Cdr ...ed to ... Medicine, exa...o asse... have SAC Br... an obs...

ecorded ry 15, a joint RAF/Ministry of Aviation unit as been f the effects of high-speed, low-level turbulence rcraft str. The unit is now in operation at El Adem, Tobruk, name "Swifter" has been conferred upon the of tri ing conducted under the control of the nander-i t Air Force. Six specially modified English ic Canb Avons) have been selected for the trials, and of abo ion are made at heights of between 100ft and by day nd sea. During the twelve months that the will last a thousand sorties is scheduled to be flown.

three p show (reading down) the special unit badge wift aga round, pierced by a red arrow; two of the erras ov ; and a refuelling scene at El Adem. (Note most of t the centre-section is painted white.) Above, f the Ca into a Libyan sunset; and on the immediate Wg Cdr L d to "Swifter" from the Institute of Aviation ine, exa assess their life-saving properties. Last we SAC Br an observer unit in a Canberra bomb bay.

# Space Station

1 Structural Spinal-column
2 Suction-assisted toilet
3 Air-intake vents
4 Damp-pad dispenser
5 Hand washer
6 Disposal bin
7 Access panels for emergency or infrequent adjustment of equipment within column
8 Food storage, preparation and dispensing equipment
9 Main instrument-console aperture
10 Positions for two operators ("scientific" and "environmental")
11 Communication hatch
12 Radiation-shield compartment
13 Air-lock
14 Air-lock hatch
15 Fuel Tank/Living Compartment
16 Domed tank-ends
17 Toilet privacy screens
18 Sleeping positions
19 Lockers
20 Relaxation position-restraining device
21 Television (entertainment) display for (20)
22 Stand-by position (crewman wears space suit)
23 Repair station
24 Space suits stowed
25 Handrails ("mobility rail" double-duty as conduits
26 Re-entry Vehicle
27 Crew seats face forward during orbital positioning: rearward re-entry
28 Pilots' seats
29 Astronaut seats
30 Retro-rocket
31 2nd Stage Engine Compartment
32 Propellant pumps
33 Gimballing actuator
34 Vernier roll-control ducts
35 Main combustion chamber
36 Gas storage bottles

EXTERNAL EQUIPMENT

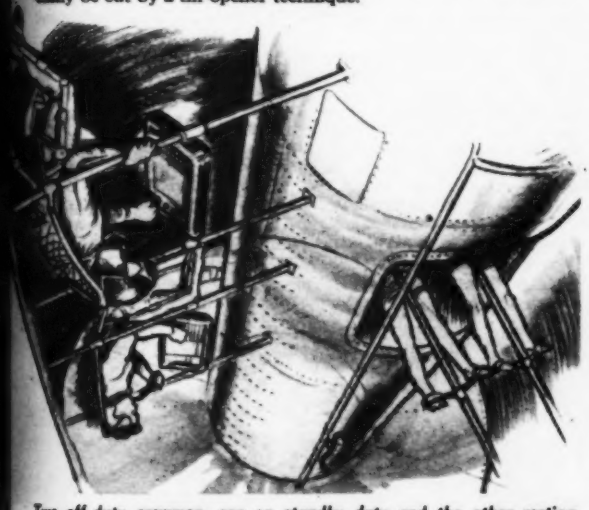
37 Solar battery cells
38 Cassegrain telescope
39 Hyperbolic mirror, at end of rigger
40 Parabolic mirror
41 Schmidt telescope
42 Orthicon tube
43 Frame hinge-line
44 Cassegrain antenna
45 Loop antenna
46 Communication antennae
47 External handrails, and attachments

# DOUGLAS-DESIGNED ASTRONOMICAL SPACE OBSERVATORY FOR "IDEAL HOME" EXHIBITION

NOW on view at the *Daily Mail* Ideal Home Exhibition at Olympia, London, the full-scale mock-up of the astronomical space observatory designed by the Missiles and Space Systems Engineering Department of Douglas Aircraft represents the result of a realistic and detailed design exercise aimed at a hypothetical, scientifically useful space vehicle which might be in operation "within the next few years." The design and operation of the vehicle and its scientific equipment is described and illustrated in this article.

The rocket vehicle consists of two propulsion stages (liquid hydrogen/liquid oxygen), a storage section and a re-entry nose, and is 108ft tall and 17ft in diameter. The first stage employs a cluster of three rocket engines, each developing 150,000lb thrust, and the second stage has a single unit of similar power (as installed at Olympia, the ASO incorporates a second-stage Bristol Siddeley four-chamber motor of 100,000lb thrust). Above the second-stage tank section the storage compartment houses the scientific instruments during flight, and the re-entry nose would be used only for emergency return to Earth.

Inside the second-stage hydrogen tank is a central column 6ft in diameter containing all the instrumentation controls and life-support devices for orbital operation. Its walls are insulated against the low temperature (−423°F) of liquid hydrogen, and the column extends through the storage section to the re-entry body. All openings in the central column are tightly closed, and additionally sealed with a thin-gauge welded cover which can easily be cut by a tin-opener technique.



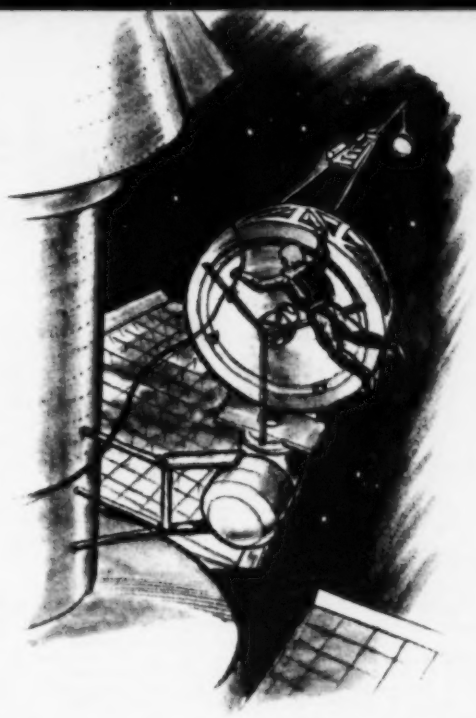
*Two off-duty crewmen, one on standby duty and the other resting (and eating). Also visible, through aperture in central column, are the legs of the scientific and environmental operators*

The launch point envisaged for the ASO is on Christmas Island, and the planned orbit is at an altitude of 300 n.m. (orbital velocity, 17,000 m.p.h.). Throughout the injection phase the four-man crew is suitably protected inside the nose.

The sequence of preparing the station for operation, once in orbit, is ingenious (see drawings overleaf). First, by remote control, the trapped gases in the hydrogen tank are vented to the outside. The nozzle is gimballed to change the vehicle attitude from coincident to 180° out of phase with the velocity vector several times during this manœuvre, in order to maintain the correct orbital velocity and raise the temperature of the tank by capturing solar energy.

When all the gas in the hydrogen tank has been vented, one of the crew, wearing a space suit, leaves the re-entry vehicle, enters the air-lock compartment and goes to the radiation-shield compartment. Here he operates a valve which releases a small amount of gaseous nitrogen into the hydrogen tank, flushing out all traces of hydrogen, and the hydrogen valve is remotely closed.

The welded seal of the hatch between the shielded compartment in the central tube and the tank is broken, and the hatch unbolted. The crewman then seals the hydrogen tank bottom outlet by welding or plastic casting; nitrogen is released into the tank, which is then tested for leaks. When the tightness of the tank seal has been checked, a 10,000ft Earth atmosphere is created within the tank. The remaining three astronauts then leave the re-entry body and start removing the stores from the shielded compartment and installing them in their assigned places in the tank.



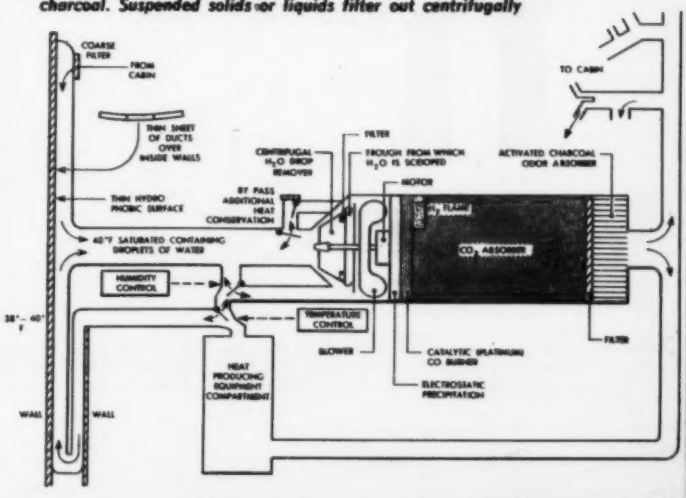
*Crewman adjusting external equipment on Cassegrain telescope*

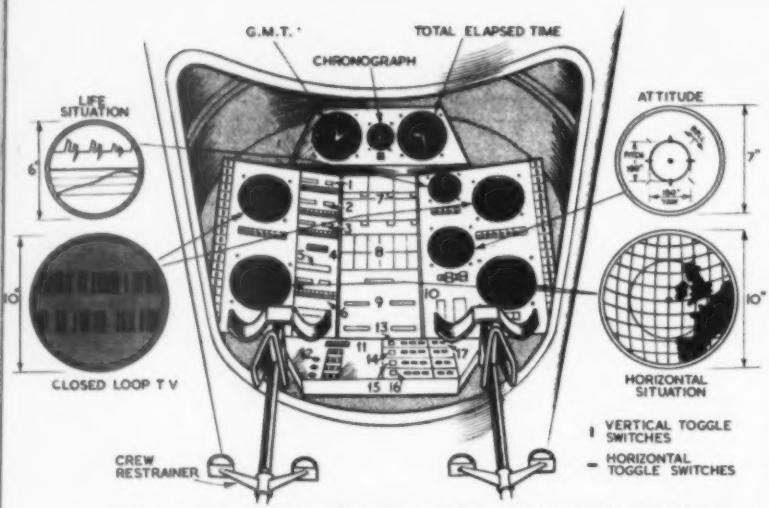
The seals over all the openings on the centre column are cut away and the control section, recirculating air ducts, food centre, repair station, lavatory, etc, are made operational. The storage-section covers are opened, permitting the solar cells to capture sunlight and provide electric power to operate all the life-support equipment. After the operation of this equipment has been checked, one astronaut enters the air-lock, actuates a pump which transfers the air in the air-lock to the main tank, opens the hatch to the outside storage section and—connected to the vehicle by a light line—steps out into space.

This astronaut proceeds to erect all the external scientific equipment and check its alignment, collimation and operation. He can communicate with the console operator inside the ASO by means of a radio in his space helmet. The "outsider" then re-enters the air-lock, closes the hatch cover, operates valves to re-establish an atmosphere and opens the hatch cover to the shielded compartment. From here he enters the H-tank, where he can now remove his space suit and place it in the rack, where it is held ready for easy access in case of emergency.

The mission of the space station is to make observations outside the Earth's atmosphere in the fields of astronomy, astrophysics,

*Schematic air-conditioning system, capable of operating 60 days continuously. Mists are removed electrostatically, CO by burning on a catalyst and other gas by burning in an $H_2$ flame or by activated charcoal. Suspended solids or liquids filter out centrifugally*






*Two crewmen would be at the control panel, one (left) controlling the scientific equipment and the other (right) dealing with environmental control, communications and data transmission*

1-3, guide telescopes; 4, scope selector switches; 5, Schmidt telescope; 6, Cassegrain telescope; 7, system diagrams; 8, environment; 9, emergency controls; 10, Geiger scope; 11, ion-chamber calibration scale; 12, ion-chamber indicator light; 13, VHF radio; 14, command radio; 15, Minitrack; 16, telemetry; 17, flashers.

meteorology, cosmology and other related sciences. Based simply on astronomical requirements, a circular orbit in the plane of the Earth's equator or in the plane of the ecliptic might simplify the mathematics of position; while on meteorological considerations a polar orbit would provide coverage of the whole Earth. At latitudes above 40°, however, the lower Van Allen radiation belt approaches the 300-mile level, and the compromise orbit chosen is therefore a circular one inclined at an angle of 40°.

The ASO is designed to remain permanently in orbit, with a relief crew and provisions being ferried out to the station from Earth every 30 days. The re-entry vehicle would be used only in case of emergency, such as loss of tank atmosphere or irremediable malfunction of life-support equipment.

Of the crew of four men, one is on duty at all times, while one sleeps and the other two rest or perform housekeeping duties, according to a strict schedule. One of the off-duty men is on standby duty and wears his space suit (with visor open). In the case of a serious meteorite impact, he can close his visor and take emergency action. Internal temperature is maintained at a fairly constant 72°, and air pressure will be equivalent to that at 10,000ft, slightly enriched with oxygen (see circuit diagram).

The scientific equipment is mounted between the top of the main tank and the re-entry capsule. Two main optical telescopes are carried, a 27in/36in Schmidt for wide-angle (5°×5°) astronomical work; and a 60in Cassegrain, used either as a long-focus telescope or as a spectrograph, and on which a Geiger telescope is mounted to determine the location of sources of cosmic-ray particles. Intelligence from both telescopes is picked up by an image-orthicon tube and electrically tape-recorded or directly telemetered to Earth.

A loop antenna is used to measure low-frequency radiation normally obscured by the Earth's atmosphere. Detectors for energetic particles, gamma rays and X-rays are used to determine particle-energy distribution and time intensity variations, and internal and external ionization chambers are fitted.

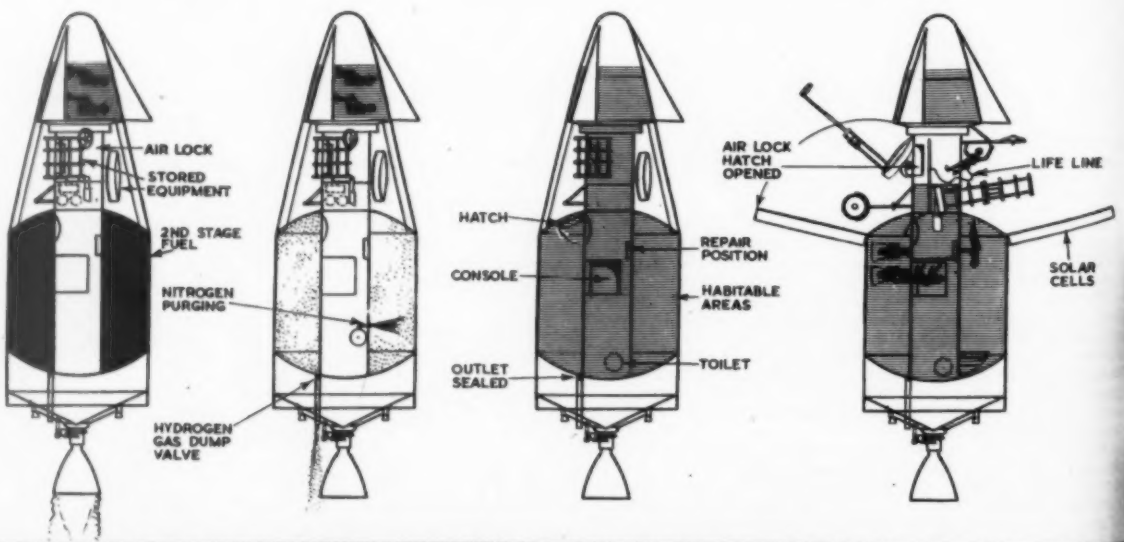
The arrangement of the two-man instrument console/control panel (see diagram) was based on the assumption that one operator would be primarily monitoring and controlling the scientific equipment, while the other would monitor the environment-control equipment and also handle communications and data transmission. The scientific operator has the necessary digital read-outs and switches to control the three telescopes of the star-tracker to maintain the capsule position, and also to keep the ASO pointed at the Sun, and the same type of equipment controls the orientation of the two large optical telescopes. The attitude control system of the vehicle utilizes a stellar-corrected inertial platform which commands the actuation of small jets and inertia wheels to maintain the orientation of the ASO in the desired position in space.

Personnel quarters are divided into five general areas. The relaxation area has two restraint positions with TV screens, and two positions for sleeping. The second area is for the preparation of food, the third for washing, the fourth is a lavatory and the fifth (located on the central column forward of the kitchen area) is the repair and test station for electrical and mechanical equipment.

Three pressure suits are stored in racks near the control console. At least one man will wear his pressure suit at all times in case of explosive decompression. He will be able to close his visor, activate the emergency pressure equipment and, if possible, repair the rupture. If repair is not possible he can assist the other crew-members to the air-lock. Adjacent to the air-lock is the shielded radiation chamber. If the radiation level remains excessive the crew would enter the re-entry vehicle and return to Earth.

Douglas studies indicate that it is feasible at present to provide a near-terrestrial environment for the crew of the ASO for the period envisaged without depending on a long development programme for the necessary equipment.

**The ASO Mock-up at Olympia.** Among the companies involved in the construction of the full-scale mock-up at the Ideal Home Exhibition are: Bristol Siddeley Engines (rocket motor); Smiths Aircraft Instruments (instruments); and Mullard (electronics).

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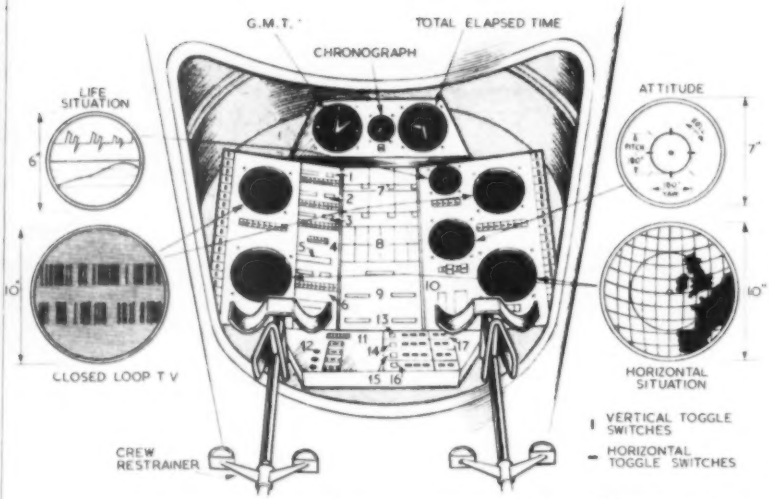


***Two crewmen would be at the control panel, one (left) controlling the scientific equipment and the other (right) dealing with environmental control, communications and data transmission***

**1-3, guide telescopes; 4, scope selector switches; 5, Schmidt telescope; 6, Cassegrain telescope; 7, system diagrams; 8, environment; 9, emergency controls; 10, Geiger scope; 11, ion-chamber calibration scale; 12, ion-chamber indicator light; 13, VHF radio; 14, command radio; 15, Minitrack; 16, telemetry; 17, flashers.**

meteorology, cosmology and other related sciences. Based simply on astronomical requirements, a circular orbit in the plane of the Earth's equator or in the plane of the ecliptic might simplify the mathematics of position; while on meteorological considerations a polar orbit would provide coverage of the whole Earth. At latitudes above 40°, however, the lower Van Allen radiation belt approaches the 300-mile level, and the compromise orbit chosen is therefore a circular one inclined at an angle of 40°.

The ASO is designed to remain permanently in orbit, with a relief crew and provisions being ferried out to the station from Earth every 30 days. The re-entry vehicle would be used only in case of emergency, such as loss of tank atmosphere or irremediable malfunction of life-support equipment.

Of the crew of four men, one is on duty at all times, while one sleeps and the other two rest or perform housekeeping duties, according to a strict schedule. One of the off-duty men is on standby duty and wears his space suit (with visor open). In the case of a serious meteorite impact, he can close his visor and take emergency action. Internal temperature is maintained at a fairly constant 72°, and air pressure will be equivalent to that at 10,000ft, slightly enriched with oxygen (see circuit diagram).

The scientific equipment is mounted between the top of the main tank and the re-entry capsule. Two main optical telescopes are carried, a 27in/36in Schmidt for wide-angle (5°×5°) astronomical work; and a 60in Cassegrain, used either as a long-focus telescope or as a spectrograph, and on which a Geiger telescope is mounted to determine the location of sources of cosmic-ray particles. Intelligence from both telescopes is picked up by an image-orthicon tube and electrically tape-recorded or directly telemetered to Earth.

A loop antenna is used to measure low-frequency radiation normally obscured by the Earth's atmosphere. Detectors for energetic particles, gamma rays and X-rays are used to determine particle-energy distribution and time intensity variations, and internal and external ionization chambers are fitted.

The arrangement of the two-man instrument console/control panel (see diagram) was based on the assumption that one operator would be primarily monitoring and controlling the scientific equipment, while the other would monitor the environment-control equipment and also handle communications and data transmission. The scientific operator has the necessary digital read-outs and switches to control the three telescopes of the star-tracker to maintain the capsule position, and also to keep the ASO pointed at the Sun, and the same type of equipment controls the orientation of the two large optical telescopes. The attitude control system of the vehicle utilizes a stellar-corrected inertial platform which commands the actuation of small jets and inertia wheels to maintain the orientation of the ASO in the desired position in space.

Personnel quarters are divided into five general areas. The relaxation area has two restraint positions with TV screens, and two positions for sleeping. The second area is for the preparation of food, the third for washing, the fourth is a lavatory and the fifth (located on the central column forward of the kitchen area) is the repair and test station for electrical and mechanical equipment.

Three pressure suits are stored in racks near the control console. At least one man will wear his pressure suit at all times in case of explosive decompression. He will be able to close his visor, activate the emergency pressure equipment and, if possible, repair the rupture. If repair is not possible he can assist the other crew-members to the air-lock. Adjacent to the air-lock is the shielded radiation chamber. If the radiation level remains excessive the crew would enter the re-entry vehicle and return to Earth.

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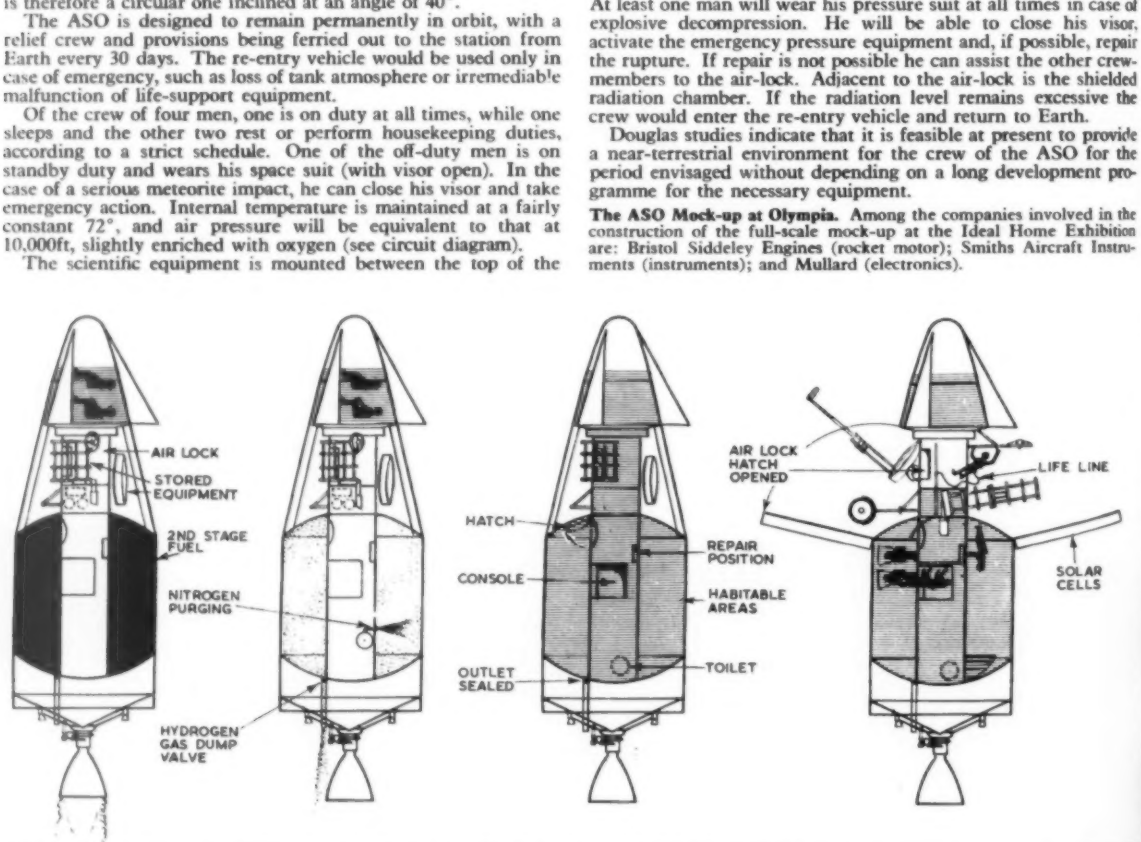


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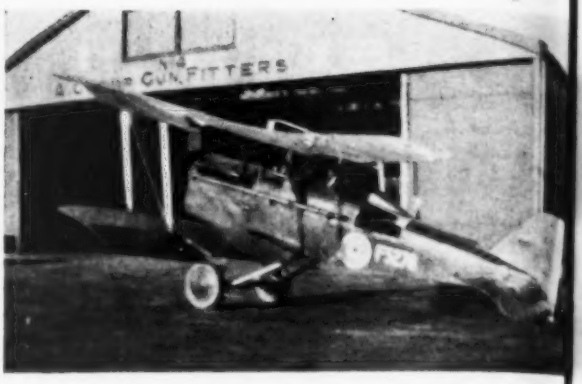



*The S.E.5 referred to in the letter from Arnold G. Wilson. The parachute housing can be seen just below the pilot's head fairing*

# Correspondence

*The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.*

### Aircrew Flight-time Limitations

THE article "A New Approach to Flight-time Limitations" by "Airline Pilot" in *Flight* for February 12 has much truth in it. Having recently left a foreign scheduled airline which well fits the description "unscrupulous operator who will drive his crews to the maximum, at the expense of safety and fatigue," for a charter company which uses multiple crews who stick with their bunk-equipped aircraft half way round the world and back, I feel qualified to express an opinion on this subject.

With the exception of two points, I am in entire agreement with the whole article, especially the remark about the present system of logging flight-time making a "mockery of the practice of assessing crew members' ability . . ."

"Exhaustion while lying on the beach" is due to the hot sun etc, and cannot be quoted as an argument on rest problems. It is quite easy to get the required rest before a flight at any time, if only the operating company provides appropriate hotel accommodation (quiet and air-conditioned where necessary) and the crew plan their lay-over accordingly. "Afternoon" by local time overseas may well be "late at night" back home! Aircrew have other compensations for the inconvenience of not being able to enjoy the usual social amenities all the time all over the world, and certain disruption of domestic routine at home.

A major cause of fatigue is when a flight is being delayed, and the crews are, nevertheless, brought out to the airfield on the off-chance of a relatively early departure, and consequently hang around for up to six hours without adequate rest facilities.

The second statement that requires qualification is that "aircrew generally dislike spending long periods in foreign countries." This only applies to those who spend all their time in hotel bars—very soon one realizes that such bars are the same all over the world, and their patrons extremely boring. Not all aircrew, however, are so shallow and single-track-minded, and one of the most fascinating aspects of airline flying is the possibility of spending appreciable time in foreign countries and getting to know the local residents as they go about their daily tasks.

It is most important to try to bring a new approach to air legislation, but all arguments should be based only on facts resulting from aircrew experience, and not on fallacies or prejudices.

Richmond, Surrey AIRLINE NAVIGATOR

REFERRING to the article "A New Approach to Flight-time Limitations" in *Flight* dated February 12, the heading seems to be an unfortunate choice considering that the writer states "it should be possible, if proper bunks are installed, to keep an aircraft flying almost indefinitely." We assume "aircraft and crew" is meant.

Members of the Danish Aircrew Union have had considerable experience with crew bunks, equipped with sheets and blankets for "off-watch" crew members. These have been installed in DC-4, DC-6, DC-6B and DC-7C aircraft and have been used on North Atlantic, South Atlantic, Far East and polar routes.

Many of our crew members experience difficulty in sleeping on board, so we prefer to define off-duty periods in crew bunks as "horizontal rest" rather than sleep.

Fatigue due to noise limits the time for which one can keep aircraft and crew together. It is now generally accepted among our members that 20 hours is about this limit.

Kastrup, Copenhagen DANSK FLYVEBESÆTNINGSFORENING,
Erich Lindenstjerna, Secretary

### Parachuting from an S.E.5

IN reference to the letter from J. M. Bruce in your issue of February 5 regarding the S.E.5, I enclose herewith a snapshot [reproduced above.—Ed.] I took whilst serving in the RFC at Farnborough. Its interest lies in the fact that this was one of the first machines I saw fitted with a Guardian Angel parachute, and I was privileged to see the early experiments.

A Major X (his name escapes me for the moment) used to take off standing on the centre section and throw himself clear. The parachute was packed into a circular container, the container being attached to the aircraft in the open locker behind the pilot—as can be seen from the photograph.

In throwing himself off the aircraft the parachutist would pull the canopy out of the elastic-bound container; at least, that was the theory until the day the anchorage came adrift complete with parachute still inside the container. I leave you to guess the rest.

It will be noticed that the standard Lewis gun mounting is apparent on the top centre-section.

I shall be glad if you will return the photograph when you have finished with it; it is one of my minor treasures of 3½ years' service in the RFC—and still flying.

Leeds 2 ARNOLD G. WILSON

### "Wings Over Westminster"

WHILST apologizing to TWA and others for the errors that crept into our book, we make no apology for giving it a political label. Politicians will decide whether or not there are to be subsidies for the Highlands and Islands routes, and for helicopter operations. The future impact of air transport on railway and ocean liner revenues is an important factor in deciding if any support is to be allocated from public funds.

But the most pressing "air political" issue is the new Licensing Bill. This gives the Minister powers to do virtually what he likes: but we do not know if he intends to perpetuate the secret hearings of the ATAC; or whether he will give the board a proper secretariat, to extract the factual data it should need. The one thing we do know is that "the board shall consider . . . [*inter alia*] material diversion of traffic . . ."—words which set the stage for a continuation of the sterile arguments that occupied much of the time of the ATAC.

The Bill itself bears numerous signs of having been thrown together in a rush: and it is to be hoped that our legislators will refine it before it becomes law.

I would like to point out that our book was a team effort, and not just my work alone.

London WC2 A. J. LUCKING

[This is the book published at 7s 6d by the Bow Group (22 St Giles High Street, London WC2) and reviewed in *Flight* for February 12 and 19.—Ed.]

## FORTHCOMING EVENTS

Mar. 7. Society of Instrument Technology (Data Processing Section): "Data Reduction for Guided Weapon Trials at Aberporth," by A. S. Younger.
Mar. 8. RAeS: "Electro Microcircuits," by Dr. J. W. Granville.
Mar. 11. RAeS: Symposium on Vehicle and Instrumentation Problems in Upper-atmosphere Research.
Mar. 12. Air-Britain: a.g.m., Annual Recognition Contest and Film Show.
Mar. 14. British Institution of Radio Engineers: Discussion on Short-range Navigational Aids.
Mar. 15. RAeS: "Some Problems of Separated and Vortex Flow," by Prof H. B. Squire.
Mar. 15. Photogrammetric Society: "A Recording Stereo Comparator," by A. H. Anstis.
Mar. 16. Royal United Service Institution: "Rockets, Satellites and Military Thinking," by Sir Frederick Brundrett.
Mar. 17. RAeS: "Supersonic Aircraft—Promise and Problems," by M. B. Morgan.
Mar. 18. RAeS Agricultural Aviation Group: Film Evening.
Mar. 18. Institute of Navigation: "The American Air Traffic Control Programme," by Dr Hans Giesecke.
Mar. 23. Royal Aero Club: a.g.m.
Mar. 24. RAeS: "Mixed Powerplants," by Dr R. R. Jamison.
Mar. 24. British Institution of Radio Engineers (Scottish Section): Radio Guidance in Automatic Landing," by J. Shayler (at Glasgow; repeated on Mar. 25 at Edinburgh).
Mar. 25. RAeS Man-powered Aircraft Group: "Aerodynamics of Man-powered Flight," by D. Perkins.
Mar. 28. Radar and Electronics Association: "Some Design Problems of Large-scale Computers," by Peter D. Hall.
Mar. 29. Institute of Transport (West Middlesex Group): "Rotary-wing Aircraft," by Sqn Ldr W. R. Gellatly.

RAeS Branch Fixtures (to Mar. 11): Mar. 7, *Boscombe Down*, "Supersonic Civil Aircraft," by R. G. Thorne. Mar. 9, *Chester*, Brains Trust.

# Are the Reins Too Tight?

## THE MINISTER AND THE PROVISIONS OF THE AIR TRANSPORT LICENSING BILL

BY now, it is expected, the Civil Aviation (Licensing) Bill will have passed the second reading—which is normally the last opportunity for major revision in the Commons. Further amendments may be made in committee, but only minor amendments are usually admitted at the third reading. It will then be up to their noble lordships. It is, of course, possible that the Bill could survive all this without the Minister committing himself to the policy which will be adopted in the actual operation of the final Act.

The essential proposals of the Bill are relatively simple:—

All aircraft to be used for reward (*or in connection with any trade or business*) will require two separate authorizations: (1) An "air operator's certificate"—certifying the operator's competence in matters of safety—and* (2) An "air service licence"—permitting the operator to carry out specified air transport services.

The air operator's certificate will be issued under the direct authority of the Minister, whilst the air service licence will be issued by a new body—the Air Transport Licensing Board (ATLB). The time-honoured Air Transport Advisory Council will disappear and the statutory monopoly of scheduled services (at present reserved to the air corporations and their associates) will cease. But, as will be pointed out below, this does not necessarily mean that the existing position of the corporations need change appreciably.

By **HAROLD CAPLAN**, DCAe, AMIMechE, AFRAeS
(Lecturer in Air Law, City of London College)

Parliament will deal with the Bill on the basis of the political principles involved. The air transport industry may judge it on the basis of economic opportunity. But its actual success will depend on further detailed legislation (as listed at the end of this article) and implementation of policy in a fashion which is impossible to predict in advance. Therefore, although the Bill gives only a bare framework upon which policy implementation may be built, any specific safeguards which the air transport industry requires must find clear expression in the final Act, otherwise they may be lost forever.

An article in last week's *Flight* aptly observed that the ATLB may be no more than "a mere puppet of the Minister" unless the calibre of its members and the wisdom of the Minister's administration are able to avoid such a result. The Minister, in fact, has an extremely difficult task to perform. By international agreement, governments have agreed to control international routes and rates, and the Minister of Aviation is the responsible Minister in the UK; he has overall responsibility for controlling all aspects of aviation in the UK; he is responsible to Parliament for the two corporations and he has certain statutory and other powers in relation to them; he has promised greater freedom to the independent sections of the air transport industry; and he wishes to delegate the licensing of the *whole* air transport industry to a separate body.

He cannot let go the reins completely on the last task listed unless he is prepared to accept the consequent invasion of his responsibilities in the first three tasks. But, as he is now committed to the task of setting up a proper licensing system, these consequences must be faced. And because any system of control involves life or death for the businesses involved it will be vital to ensure that jobs and livelihoods cannot disappear by the exercise of arbitrary power beyond the reach of the Queen's Courts.

Once control is assumed by the ATLB the next problem will be to avoid the excesses of "monopoly by licence," whereas previously there was "monopoly by statute." For example, the ATLB could consider that it was discharging this responsibility by keeping a strict control over charges and standards of service in the event that a *single* operator is licensed for specific services. Alternatively, the board could consider that the principal problems are best served by regulated competition. In either case the ATLB needs a power, an independence and a fact-finding apparatus which appear to be lacking in the present Bill and cannot easily be supplied subsequently by "policy statements" or subordinate legislation by the Minister.

Viewed as a device for preserving the *status quo* the Bill may be regarded as excellent. Within three months of its becoming operative (as to licences) the Minister will publish a list of those operators who will automatically receive licences—on as yet unknown terms. It will then be necessary to issue new or more permanent licences as the initial ones expire. How will this be decided? Looming large in the matters which the ATLB must consider are the adequacy of existing services; whether there would be "wasteful duplication" or "material diversion" from such services; and the financial or other commitments of existing authorized operators.

This is a conservationist doctrine of the highest order which is unlikely to be tempered by such other specified factors as "the need for any air transport service"; "any objections or representations" to be made by as yet unspecified classes of persons; and, finally, a silken thread of incalculable strength—"any observations made to the board by the Minister." Not "orders" or "directions"—merely "observations."

This is the most serious single criticism which can be made. The terms of reference for the ATLB are hopelessly inadequate when compared with other systems—for example, in Canada and the USA—and are not even as mindful of the air-travelling public as are the present terms of reference of the ATAC!

If there is to be no consideration of a fair deal for the public, if there are to be no incentives or rewards for efficient operators, if there is to be no certain means of obtaining accurate and detailed economic data—what will be the magic conferred by the ATLB's "approval" of domestic tariffs? There will be no merit in such approval except to place the charges in a sanctified category. True indeed that the ATLB must consider representations from *any* person on matters including charges. But what apparatus can they use to evaluate such key problems as price policy? In other spheres of commerce, under the Restrictive Trade Practices Act it is usually against the public interest for prices to be fixed except by economic competition.

At the very least it seems necessary to call for a thorough examination of the principles involved in any form of economic control over an industry which is essentially international and competitive.

It is possible that the ATLB could use as yet unspecified regulations to call for complete economic data whenever an application is made for a licence. This will apply only to the specific operator. In order to be adequately briefed the board will need to be continuously supplied with information from all sectors of the industry. Section 14 of the Civil Aviation Act 1949 could perhaps be used more fully for this purpose.

Procedure for the ATLB has yet to be promulgated. Nevertheless it is clear that the Minister regards the board as an administrative tribunal even though it will exercise quasi-judicial functions. It is an important principle of English public affairs that not only should justice be done, but that it should be seen to be done. This means that public hearings and publication of decisions with reasons are essential. For comparison one may cite the American CAB reports or the UK Transport Tribunal reports.

The specified method of appeal is to the Minister. Nevertheless under English law it would usually be possible to question the jurisdiction of the ATLB and to raise questions of law generally in the Queen's Courts.

Several other matters may cause difficulty in the working of the Bill. Some of the more interesting are: What categories of "trade or business" aircraft will be within the scope of the licensing provisions? Will the Minister's or the ATLB's approval of the air corporations' tariffs be conclusive evidence that their charges are "reasonable" in accordance with Section 3 (1) of the Air Corporations Act 1949? Can the wording of Section 1 (3) (c) and (d) of the Bill be clarified? Will licences be granted for specific routes and specific frequencies with specific aircraft, or will they be granted for broad types of service only? Has it been noticed that the maximum penalty under Section 8 (4) of the Civil Aviation Act 1949 conflicts with the maximum under Section 6 (1) of the Bill? How will the ATLB *ignore* safety when assessing an operator's competence to operate as a "fit and proper person"? Why cannot members of the ATLB be completely independent of any interest in an aircraft operator when they sit in judgment on the industry?

The writer has not attempted an exhaustive review of all features of the Bill. A vigorous House of Commons may perhaps

**As printed, the Bill has "or" instead of "and." A clear oversight.*

## ARE THE REINS TOO TIGHT? . . .

make many changes at the second reading. No one can yet judge the value of the Bill *vis-à-vis* air safety. Experience of the past has shown that the evil is not so much adequate regulations as an adequate enforcement system. As a problem in manpower this may still remain an obstacle despite the theoretically greater control provided by the "air operator's certificate."

As an instrument for promoting the well-being of the air transport industry the Bill appears incomplete because the ATLB is given inadequate powers or terms of reference. It has not been supplied with sufficient eyes or ears: it is given only part of a brain, and little sense of public responsibility. It is asking too much of any body of men, however eminent and experienced, to cripple them in this way.

### MATTERS NOT DISCLOSED IN THE BILL
**(Mainly to be dealt with by subsequent Statutory Instrument)**

Regulations relating to the "air operator's certificate" [S.1(2)(a)].

Terms for carriage of passengers "at a separate fare" [S.1(3)(d)].

Otherwise unspecified exemptions from the requirements for an "air service licence" [S.1(3)].

List of countries whose aircraft will have to comply with the same requirements as UK aircraft [S.1(4)(b)].

Persons with whom the Licensing Board may be required to consult [S.2(1)].

Description of the conditions which may be attached to "air service licences" [S.2(1)].

Conditions under which exemptions may be granted from the requirement to have tariffs approved by the board or the Minister [S.2(5)].

List of persons who will automatically receive "air service licences" and the conditions under which they will receive them [S.2(6)].

Circumstances in which Minister will allow the board to issue licences to non-British persons or companies which are substantially non-British [S.2(7)].

Regulations for publishing notices of applications, and for making objections, etc [S.5(1)(a)].

Persons who may be heard by the board [S.5(1)(b)].

General and special provisions relating to appeals from the board to the Minister [S.5(1)(c)].

Fees to be paid [S.5(1)(d)].

Forms of application, objections, etc. [S.5(2)(a)].

Information and documents to be supplied by applicants for licences [S.5(2)(b)].

Arrangements for the cancellation or variations of licences [S.5(2)(c)].

The procedure of the board [S.5(2)(d)].

The extent and manner of application of the requirements to the rest of the British Isles, colonies, protectorates and trust territories [S.10].

Dates on which different sections will come into force [S.11].

Names of members of board [Schedule Para. 1].

Circumstances in which Minister may declare member's office vacant by reason of member's interest in aircraft or aerodrome operation [Schedule Para. 7].

# AERONAUTICAL BOOKSHELF

**Desert Squadron, by Victor Houart. Souvenir Press Ltd, 94 Charlotte Street, London W1. Price 16s. Illustrated.**

NOBODY who flew in the Western Desert during the war can ever forget the atmosphere of that dusty but often strangely beautiful battle arena. This book by a Belgian journalist tells the story of one of the Beaufighter squadrons, No 272, which operated over the desert and the Mediterranean. M Houart's interest in the unit stems from the Belgian crews who operated with it, and his writing brings back vividly the exploits and disasters of those stirring days. No 272 was one of the squadrons which came into being for the war, had its days of glory, then disappeared from existence. The book is neither a history of it nor a novel; in some ways it falls awkwardly between the two types of narrative. But it successfully conveys the gallantry of wartime airmen whose normal lives had been humdrum and earthbound. H. W.

**Dictionary of Aeronautical Engineering, by J. L. Nayler. George Newnes Ltd, Tower House, Southampton Street, London, WC2. Price 30s. Illustrated.**

AT first glance this compact volume appears to be the best small aeronautical dictionary yet published in the English language. Closer acquaintance confirms this hope; but it also reveals strange weaknesses which should be corrected in the next edition. On the very first page appear several questionable statements. American Air Lines (*sic*) is given as the meaning for A.A.L., whereas in fact the air-transport world calls American Airlines (one word) AA. If Aerolineas Argentinas were really called "A.A.E.d.E." we should never have sold them Comets; lexicographers should always be wary of pedantic initials. A.I.D. is said to mean "Air Inspection Directorate" instead of Aeronautical Inspection Directorate, while Mr Nayler has invented something called A.M.C. which he says is Air Manufacturing Company—"A company formed to design, construct and produce the D.H.121 airliner. . . ." Presumably he was thinking of Airco.

Throughout the work there are similar curiosities, and quite a number of definite mis-statements. Nevertheless the reviewer confidently recommends it as being the best dictionary of aeronautical terms readily available. At the price it is within the reach of everyone who feels the need for such a work, and it is clearly printed and neatly illustrated with small line drawings. A revised edition with the necessary rectifications would be a worthwhile undertaking. W. T. G.

**Five Down and Glory, by Gene Gurney; edited by Mark P. Friedlander, Jr. Putnam & Co. Ltd, 43 Great Russell Street, London, WC1. Price 25s. Illustrated.**

THE American air forces applied one yardstick throughout the wars of 1914-18, 1939-45 and Korea. It was simply that if a pilot destroyed five or more enemy aircraft he was categorized as an "ace." Now there are a lot of these "aces" in America today. Their claims have been most carefully assessed—so carefully in fact that Maj George E. Preddy, for example, is credited with 30.83 kills! This sort of precise calculation is the result of as many as 23 pilots taking part in destroying one enemy aeroplane. Imagine telling the intelligence officer: "I got one twenty-third of a 190!"

Apart from such a definition of an "ace," which may appear to be rather easily come by, this American book is an interesting summary of the prowess of the American air forces over 40 years. It contains a section on the air war in Korea which probably contains the most accurate information of all, for a special board was set up by the US Air Force to assess the qualifications of each pilot who claimed a place in the list.

The Pacific war is also dealt with at length, and the story fills in many of the gaps which have existed in the British general knowledge of the air war there. The Jap was clearly as tough as the German nearer home, and the numbers of aircraft and the tactics he used were sometimes similar. The wiles which the Americans used against them are worthy of comparison with the most cunning deceptions practised by the RAF in Europe. There was one occasion when a raid by a hundred Jap Bettys and Zeros were beaten off without a shot being fired. It was engineered on the spur of the moment by Capt Joe Foss, leading the crack Flying Circus fighter unit of the Marine Corps. When he saw how outnumbered he was, Foss did not attack; instead, he led his pilots over their airfield in the pretence that they were decoys to entice the Japs to attack, so that other fighters hiding in the sun could then swoop. There were, of course, no other fighters; but the Japs thought there must be, dumped their bombs in the sea and fled for home. A. C. B.

**Drawing Aircraft, by Frank Wootton. The Studio Ltd, Hulton House, Fleet Street, London, EC4. Price 5s.**

FRANK WOOTTON continues to paint and draw aircraft with a subtlety and sympathy for the subject and its element that few other artists achieve. He appreciates that aeroplanes must be put in their right setting, and this involves not only a study of skies but of such diverse subjects as ground service vehicles and figure drawing.

All these matters are dealt with in *Drawing Aircraft*—illustrated with many of Mr Wootton's superb charcoal sketches; and his advice, backed by long experience, should prove a continual source of inspiration to the student. F. M.

## ROBERT PERFECT FLYING SCHOLARSHIPS

DETAILS of the Robert Perfect Flying Scholarships for 1960 have been announced by the Air League of the British Empire. It is open to any British subject, either boy or girl, under the age of 21 at March 31, who is medically fit and has attained the minimum age to fly solo in a glider. Pilots who hold or have held civil licences, or who have qualified as Service pilots or obtained a "C" or more advanced gliding certificate, are not eligible.

Six scholarships are being awarded this year, providing a 14 days' flying training course at gliding clubs selected by the Air League in consultation with the British Gliding Association. Awards are being made to the authors of the six best essays on the following statement: "One of the objects for which the Air League was founded in 1909 was to disseminate knowledge and spread information showing the vital importance to the British Empire of aerial supremacy, upon which its commerce, communications, defence and its very existence must largely depend."

Entries must be in by June 1 and further details can be obtained from the Air League at Londonderry House, 19 Park Lane, London, W1.

*Shackleton MR.3s of No 206 Sqn at RAF St Mawgan, which was visited last Friday by four senior officers of the Spanish Air Force, including the chief of its ASR services*

# SERVICE AVIATION

*Royal Air Forces and Naval Flying News*

### Change at Spitalgate

HAVING commanded RAF Spitalgate since September of last year, Gp Off Janet Bannatyne has now become WRAF Administrative Officer at Technical Training Command headquarters. She is being succeeded at Spitalgate (from May 16) by Gp Off Felicity Hill, who has been CO at RAF Hawkinge since April last year.

### Visitors from Peru

THE Peruvian Ambassador to Spain, Dr Manuel Cisneros, went to Little Rissington last Friday to see something of Royal Air Force activities at the Central Flying School. The party, which included General Enrique Ciriani, head of the president's military household, and the naval and air attachés, watched a flying display by Hunters, Jet Provosts and various types of Westland helicopter.

### RAAF Training Changes

UNDER changes being made "in the interests of economy and efficiency," RAAF training units doing similar tasks are being grouped together on permanent stations and two bases are being closed. One of these is Rathmines, NSW, where the Officers' Training School has been situated. The school and its allied activities are being transferred to Point Cook, and other units moved to the School of Technical Training at Wagga. Moving from Point Cook, the RAAF Staff College is going to Canberra, where it will be near to the Department of Air. The other base being closed is Ballarat, Victoria, where the School of Radio was situated.

### Merciful Detour

A COMET of No 216 Sqn which left Lyneham on February 23 on a scheduled flight to Aden via El Adem and Nairobi, was making a diversion of over 5,000 miles to bring a Naval polio victim from Cape Town. The Comet, which had aboard Julian Amery, Under-Secretary Colonial Office, and the new Supreme Commander Middle East, General Sir A. D. Ward, was flying from Nairobi to Cape Town and back to Nairobi with the sailor, Ord. Art. Bernard Kelly, before resuming the schedule and then returning to the UK, being due back at Lyneham last Sunday.

### Uxbridge Honour

ONE of the oldest and most famous RAF stations, Uxbridge, is to receive the Freedom of the Borough of Uxbridge on March 19. This honour marks an association between borough and station which dates from August 1919, when the RAF Depot was established soon after the disbandment of the RFC Armament and Gunnery School which had been there for two years previously; and between the wars many thousands of young men received basic training at the station, this role inspiring its motto "Juventutem Formamis" ("We form the young"). The Queen's colour for the RAF in the United Kingdom is housed at Uxbridge and during the ceremony marking the granting of freedom will be paraded on the station parade ground.

## In Brief

The Minister of Defence, Harold Watkinson, flew out to HMS *Victorious* in the Channel on February 22 by RN helicopter from Portsmouth for a day's visit.

HMS *Eagle* is to be modernized at a cost of £20m. This was stated by the First Lord of the Admiralty, Lord Carrington, during a visit to Plymouth last week.

Wg Cdr A. R. Poole has been appointed CO-designate of No 1 (County of Hertford) MHQ Unit, RAuxAF, one of three maritime headquarters units whose formation was announced last November.

In October last year 1,002 youths began training for regular careers in the RAF, and in February this year that record figure was exceeded when 1,057 candidates qualified for training.

A total of £10,013 has been received by the RAF Benevolent Fund as a result of activities organized by RAFA branches in connection with Battle of Britain Week last year. The comparable 1958 figure was £11,987.

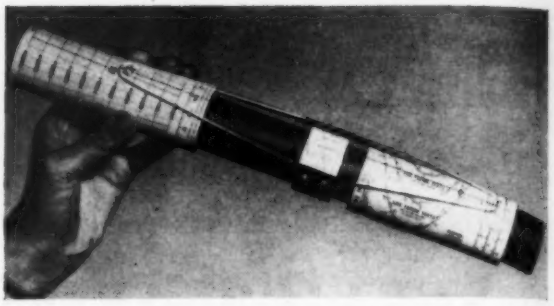
The Boyd Trophy, awarded annually for the year's finest feat of Naval aviation, was being presented to No 781 Communications Sqn at RNAS Lee-on-Solent last Wednesday (March 2) by the Flag Officer Air (Home), Vice-Admiral D. E. Holland-Martin.

A history of RAF Scampton is being compiled and Sqn Ldr T. Stafford writes: "We would be most grateful if any of your readers will supply copies of photographs taken at Scampton in past years. We would be happy to receive any other material—copies of official programmes, for example. Any negatives or prints loaned would be carefully handled and returned promptly." The address of the station is Royal Air Force, Scampton, Lincoln.

The annual reunion of Coastal Command officers is being held in the officers' mess at the command headquarters, RAF Northwood, on May 7 at 6 p.m. Buffet supper will be served and dress is lounge suits. All officers who have served in Coastal Command since September 3, 1939, are eligible to attend; particulars and tickets (15s each) may be obtained from the hon sec, Wg Off S. P. Titcombe, OBE, WRAF, at Coastal Command headquarters.

*Scenes from Gan Island, where the RAF staging post (in return for the establishment of which Parliament was last week asked to authorize a payment of £100,000 to the Maldive Government) is now in full operation. At left below is the commanding officer, Wg Cdr I. Thomas; centre, the control tower, with Flt Lt D. Schwab on ATC duty; and, at right, four RAF personnel walk past a Hastings of Transport Command. (A photograph of the airfield, taken from the air, was published on this page on December 25)*

# THE INDUSTRY



*de Havilland Aircraft of Canada, Downsview, Ontario, have patented this cylindrical slide-rule for determining aircraft weight and balance. It gives step-by-step indication of loading in relation to limits and permits direct reading of weight, c.g. and moment index at any stage without calculation. The effect of each factor or group of factors added or removed is registered individually, and adjustments may be made to offset adverse weight or c.g. trends as they develop*

## US Interest in King Aircraft Corporation

THE well-known Glasgow manufacturers of aircraft components and fittings, King Aircraft Corporation, announced last week that H. K. Porter & Cie SA, international subsidiary of the H. K. Porter Co Inc of Pittsburgh, had acquired an interest in their business.

It was stated that King Aircraft Corporation would continue to be operated by their present team, headed by J. McEwan King as chairman and managing director.

The specialities of the Glasgow firm—particularly fasteners, clamps and couplings—have been widely used by the aircraft industry for many years past. Products of the 16 Porter divisions and subsidiaries include refractories, chemicals, rubber and friction materials, paint, steel and non-ferrous metals, electrical equipment and fabricated metal products.

## BS G.100: Aircraft Electrical Equipment

IN order that the revised British Standard G.100 *General Requirements for Aircraft Electrical Equipment* shall be as comprehensive and valuable as possible, the British Standards Institution is anxious to receive comments from the industry and all other interested parties. The original G.100 was published in 1952 and—particularly in Pt 2 (*Environmental and Operating Conditions*)—many changes are necessary in the light of the requirements of modern high-performance aircraft operation.

Nominally the last date for receiving comments is March 7 (Monday next), but the Institution will be pleased for communications received as soon as possible after that date to be considered by the technical committee concerned. Comments should be sent to the BSI at British Standards House, 2 Park Street, London W1.

## Ultra Orders

THE Indonesian Navy has placed a £300,000 contract with Ultra Electronics Ltd for anti-submarine aircraft equipment. Ultra sonobuoys (Type T.1946) which will be supplied under the contract will be used in conjunction with receiving equipment now being installed in the Gannets supplied by Fairey Aviation to the Indonesian Navy. D. S. Macintyre, Ultra senior sales engineer, recently visited Djakarta and negotiated the contract with the Indonesian Chief of Naval Aviation.

Other news from Ultra Electronics is that their turbine speed and jetpipe temperature control amplifier are being supplied for BOAC's Boeing 707s. They have also supplied the communications control system; the equipment selected is the Ultra UA 57.

## Fluorescent Finishes

MUCH attention has lately been given to the matter of enhancing air safety by the use of fluorescent colours. From one well known manufacturer of aircraft finishes—Docker Brothers, Ladywood, Birmingham 16—come details of materials they have produced to meet this demand. Known as "Dockerblaze," their fluorescent finish is stated to "maintain an amazing degree of brightness for periods well in excess of 12 months." They suggest that the finish will not only be of value for making aircraft conspicuous, but also for such detail uses as marking emergency access points, and also for use on airfield vehicles. The finish is stated to have high resistance to ester-based lubricants, kerosine, mineral oils, water/methanol mixtures and de-icing fluid. It can be released as conforming with ARB requirements for a proprietary material, pending the issue of a specification.

The colour range is identified by the names rocket red, blaze orange, signal green and Saturn yellow. It is essential, say the manufacturers, that paint schemes in this material be applied in close conformity with instructions, i.e., with a suitable primer and "Dockerblaze" white undercoat; application of a finishing varnish then ensures a high-gloss finish and the required durability.

Also announced by the company is "Fibrecolor," which, used for tinting polyester laminates in aircraft structures, renders a laminate fireproof. Tests, say the company, show that materials so treated met ARB requirements for fire resistance. Finally, under the title of "Fibreblaze" there is a new material for colouring polyester laminates with a fluorescent finish; it is available in red, orange, yellow and green.

## Titanium Bolt Prices Reduced

THE weight of titanium alloy bolts is only 53 per cent of that of mild steel bolts of the same size, and the newer material, of course, has superior fatigue properties. Guest Keen & Nettlefolds (Midlands) Ltd last week announced a "striking reduction" in the prices of these bolts. This, they state, is the result of improved production methods—it was found that the percentage of rejections among many thousand bolts produced in a research programme was smaller than expected—coupled with price reductions which ICI Metals have been able to make in the raw material.

"Fortunately for the aircraft industry," say GKN, "these price reductions are largest in the smaller diameters such as 10-32 UNF, ¼in and ⅜in, in which the greatest demand is found. Instead of quoting examples of cost, say, per 100 bolts, it is of more practical value to quote the cost per pound weight saved compared with mild-steel bolts. Even with the maximum discount for quantity, this cost could have been in the region of £40 to £50 per pound weight saved, depending on diameters selected. Now, using ¼in diameter bolts as an example, this cost has been reduced to the region of £24 to £26 per pound weight saved, and in the case of some popular length bolts in larger diameters it has even been reduced to the striking figure of £17 10s per pound weight saved—a figure far below that generally regarded as the cost of research and development necessary to achieve an equal weight reduction."

The company add that reductions of comparable magnitude are unlikely in the near future, although there is a possibility of the average price of bar stock falling to £5 per pound.

## IN BRIEF

Castrol House, the 15-storey building erected in Marylebone Road, London NW1, for the Wakefield Castrol Group, was formally opened on February 22 by Ernest Marples, Minister of Transport.

J. A. Benn, formerly of Waymouth Gauges & Instruments Ltd, has joined the Aircraft Engine Instruments Division of Elliott Brothers (London) Ltd as technical liaison engineer.

Winston Electronics Ltd announce that Joseph Samuels, purchasing director for several years, has been appointed works director in charge of production.

Gp Capt E. A. Warfield, CBE, DFC, who recently resigned his appointment as director (training) with Air Service Training Ltd, has been appointed general manager of the Avica group of companies at Hemel Hempstead.

Gordon Wansbrough-White, ARAeS, is joining the Metal Industries Group on April 1 as assistant to the group's organization and methods officer. At present with Bristol Aircraft Ltd, he is an O and M officer with computer experience and is a qualified pilot. Three weeks ago he contributed the feature article "Fifty Bristol Years" to *Flight*.

Aircraft-Marine Products (Great Britain) Ltd are now at Ample House, 87-89 Saffron Hill, London EC1, a new building in which they have centralized their head office, research laboratory, sales and engineering departments, prototype and service workshops, and international division. Production of solderless terminals remains at the company's Port Glasgow works. Also announced is the appointment of D. W. Bray, BSc, AMIEE, as engineering manager.

K.L.G. high-energy igniters, Type KR-104, have been approved by Rolls-Royce and the ARB for all Dart engines. In laboratory tests believed to be the most exhaustive ever conducted on igniters, static K.L.G., the KR-104 showed a life some three times longer than that of the older types. The new igniter is operated from a high-energy unit providing 12 Joules at 2kV but is also suitable for use with units of lower output.

Reynolds (Packaging) Ltd of Alfred's Way, Barking, Essex, have for many years specialized in packaging equipment for Government departments and industry. They already have humidity-controlled rooms and they have now added an air-conditioned room which will enable particular classes of equipment to be cleaned and sealed under dust-free conditions. Among items dealt with in this new department the firm cite precision equipment, particularly for guided weapons; electronic actuating gear; filtration and oxygen breathing equipment; and flexible and rigid hose assemblies.

*The first picture of an Il-18 in "export" markings is seen here: the operator is CSA. The Czech airline has six on order. Colour scheme is now red instead of blue; this applies also to the airline's Tu-104As, of which four are now in service. These jets will serve the London - Prague route on April 1*

# AIR COMMERCE

## TWO TRAGEDIES

BARELY two months after a VASP Viscount and a Brazilian Air Force T.6 collided over Rio de Janeiro Airport on December 22, a second collision occurred in this area. In rain and mist on the afternoon of February 25, a REAL DC-3 and a US Navy R6D (DC-6) carrying US Navy bandsmen and anti-submarine personnel collided below the Sugar Loaf Mountain and crashed into Guanabara Bay. Of the 38 passengers and crew on board the DC-6 and some 30 on board the DC-3, there were only three survivors, all US Navy bandsmen who were accompanying President Eisenhower on his tour.

Both aircraft were said to be on the approach; one was in fact already on finals when the collision occurred. At the time of the accident, both President Eisenhower and President Kubitschek of Brazil were visiting Sao Paulo. They flew back immediately to Rio and visited the survivors in hospital.

Less than 24 hours after the accident at Rio, an Alitalia DC-7C I-DUVO crashed in western Ireland shortly after take-off from Shannon. Of the 40 passengers and 12 crew on board, 30 lost their lives. An airport official was quoted as saying: "There seems to have been some sort of explosion. The blaze was on the ground." The aircraft struck the walls of a cemetery and "left a trail of fire one mile long across a sheep pasture."

Unfortunately, no member of the flight-crew survived. The accident occurred about 3,000yd from the end of the runway: according to *The Times*, the cause is believed to have been failure of one of the port engines. All survivors were in the tail section.

## TRANSPORT CONGRESS

FOR aviation people the highlight of the Institute of Transport's forthcoming 1960 Congress in London is likely to be a paper to be read by Peter Masefield, *British Transport Aeronautics—Looking Ahead*. This is due to be given at 11 a.m. on April 28 at the Waldorf Hotel, where the congress is to be held in the Adelphi Suite.

The congress will be opened by the Minister of Transport, Mr Marples, at 9.45 a.m. on the previous day. Two other papers will be read: *Some Thoughts on the Future of Inland Transport*, by General Sir Brian Robertson, Chairman of the British Transport Commission (April 27, 10 a.m.), and *British Shipping—A National Service or a Commercial Enterprise?* by Sir Donald Anderson, chairman elect of P & O (April 28, 10 a.m.). Details may be obtained from the Institute of Transport, 80 Portland Place, London W1 (Langham 5216).

"Flight" photograph

*Seen at GAPAN's annual banquet at Grocers' Hall, London, on February 23 were, left to right: Lord Brabazon; Lady Stockdale, Lady Mayoress; Dr Kenneth Bergin; Mrs Bergin; Sir Edmund Stockdale, Lord Mayor of London; Wg Cdr C. A. Pike; and Mrs. Pike*

## 1960's BAD START

THE first two months of 1960 have had more than their statistical share of accidents; since January there have been eight fatal accidents and, at a provisional estimate, 265 passenger lives have been lost. The following reviews the 1960 accident record to date:—

| Date | Carrier | Aircraft | Location | Fatalities Pass. | Fatalities Crew | Circumstance |
|---|---|---|---|---|---|---|
| Jan 6 | National | DC-6B | Bolivia, S. Carolina | 29 | 5 | Sabotage† |
| Jan 18 | Capital | Viscount | Holdcroft, Virginia | 46 | 4 | Mechanical failure? |
| Jan 19 | SAS | Caravelle | Ankara | 35 | 7 | Hit hill on approach |
| Jan 21 | Avianca | Super Constellation | Montego Bay | 37* | – | Heavy landing |
| Jan 27 | Transportes Aereos de Timor | Heron | Timor Sea | 7 | 2 | ? |
| Feb 5 | Lloyd Aero Boliviano | DC-4 | Cochabamba | 55 | 4 | Take-off |
| Feb 25 | REAL | DC-3 | Rio de Janeiro | 30* | ? | Mid-air collision with DC-6 |
| Feb 26 | Alitalia | DC-7C | Shannon | 19* | 11* | Take-off |

*Provisional. †The CAB said last week that it now had "conclusive evidence" that a dynamite explosion had occurred near the seat of Julian Frank, the New York lawyer who had been heavily insured before the flight. Pieces of steel wire and manganese dioxide, a substance found in dry-cell batteries, were found in his body.

## AIR SAFETY VALVE

WHEN air safety becomes threatened by commercial pressures it is as well that the safety valve should occasionally be allowed to blow. Performing this function at the annual banquet of the Guild of Air Pilots and Air Navigators last week, Lord Brabazon, speaking as chairman of the Air Registration Board, hoped that his voice would "be heard around the world." Every new machine that we saw, he said, introduced new hazards for the pilot. Piloting aeroplanes was becoming not easier and easier but more and more difficult. In particular:—

- The ratio of stalling speed to cruising speed is still "lamentable."
- If people are killed in an accident on an aerodrome because an operator is using petrol instead of paraffin "he should be had up for manslaughter."
- It is odd that in 1960 we had still not got a non-flam hydraulic fluid in service.
- It is rather odd that pilots are allowed to fly through thunderstorms although the forces in quite moderate ones can tear a wing off.
- It is *very* odd that an aeroplane costing over £1m should be widely sold throughout the world and accepted by operators when on asymmetric power 160lb is required on the pedal just to keep it straight.

Take-off and landing speeds, said Lord Brabazon, had all steadily increased, and various governments were prepared to produce longer and longer runways. "You can hardly expect the designer to keep out of the race for pure speed. I had hoped that one day on an international basis there would be a limit put to this trend and a definite length of runway determined." A rule should be laid down that if we are to have a Mach 3 transport in the 1970s it should have vertical take off and landing —or we should have a standard runway rivalling the M1 in length.

The theory that the pilot is an automaton to be put in any machine the designer likes, said the ARB's chairman, should be resisted. The modern pilot had to understand a complexity of dials that would put a computer to shame. "He has got to drive at a speed faster than most racing cars until he gets to $V_2$ when he proceeds to do what is called rotate—it's a wonder he isn't head over heels by that time."

*One of the ten DC-7Cs recently converted for Pan American by Lockheed Aircraft Services to an all-cargo configuration is here seen uplifting a load for the US. Present trends in the cargo-conversion market are discussed below*

"Flight" photograph

## AIR COMMERCE . . .

### CONVERT THEM TO CARGO

THE DC-7C is probably among the least saleable of the many piston-engined airliners now surplus to airline requirements. The smaller operators hesitate to take on Wright Turbo-Compounds, and in any case the DC-7C was a "quality competition" development of the DC-6/7 family aimed at maximum speed and range rather than improved economics.

So Pan American decided to convert their surplus DC-7Cs to all-cargo operations (see photograph), estimating that it would be more economic to spend about £1m converting them for cargo work rather than to dump them on a buyer's market. A list of other cargo-conversions appears in the table.

Meanwhile, what of BOAC's DC-7Cs? Three months ago, *Flight* reported (November 27, page 652) that the corporation's DC-7Cs were up for sale, at the nominal price of a million dollars each. At the beginning of last month there was a report in the *Daily Mail* that the two-year-old British independent Overseas Aviation (which has quietly bought nine of BOAC's Argonauts) was planning to buy two of their DC-7Cs. This was not confirmed by BOAC, who said that their DC-7Cs were not yet up for sale, and would not be until the end of the 1960 summer season.

The corporation is, of course, still using its DC-7Cs and is utilizing them hard (at a rate of 11 hours a day quite recently). At the same time it is possible to see—almost every day on the ramp at London Airport North—one of Pan American's converted DC-7Cs taking aboard freight that could just as well be going aboard a converted BOAC DC-7C. So far as *Flight* is able to ascertain, the corporation has no plans at present for such a conversion programme.

| Airline | Type | Quantity | Conversion by | Approx. cost | Date of order | Timescale |
|---|---|---|---|---|---|---|
| PanAm | DC-7C | 10 | Lockheed A.S. | £1m | Sept. 59 | All now in service |
| United | DC-7 | 10 | Douglas | £1.73m | Jan. 59 | Five now in service |
| American | DC-7B | 10 | Douglas | £1.5m | Jan. 59 | All in service |
| Air-India | L.1049G | 3 | Lockheed | ? | Sept. 59 | Work in hand |
| Eastern | L.1049C | 5 | Lockheed A.S. | £0.35m | Feb. 60 | Work in hand, July-August delivery |
| Lufthansa | L.1649A | 2 | Lockheed A.S. | ? | Feb. 60 | |
| Skyways | L.749A | 3 | BOAC | ? | Oct. 59 | One in service |

### UNITED NEED BOEING 727s

THE president of United Air Lines, William Patterson, says that his airline expects delivery in the spring of 1961 of the first of its 20 Caravelles recently ordered from Sud at a cost of $65m (£23,214,000). Delivery will, he says, be completed by February 1962, and autumn of 1961 is the planned target date for the inauguration of domestic services. And by 1964, Mr Patterson says, "United will need 40 Boeing 727s."

The president has not enlarged further on his Boeing 727 plans. It might have been expected that having ordered the Caravelle, and in view of the fact that Douglas have decided in principle to build this aircraft, United would have decided to standardize on the French-designed jet for a reasonable period (indeed, this might have been Douglas's expectation in deciding to sponsor the Caravelle). But now it seems that United must be planning on a very fast rate of Caravelle depreciation—two to three years—if their plans to buy 40 Boeing 727s are indeed serious.

Of the 727 design itself, Lord Douglas of BEA said on his return from a recent visit to the US West Coast that Boeing have produced answers "closely similar to those reached by de Havilland in their discussions with BEA about the D.H.121 over the past 2½ years." Meanwhile *Aviation Week* reports that the 727's 65-88 seat fuselage is of the same diameter as the 707 [12ft 4in], and that length is about the same as that of the Electra [104ft 6in].

### THE TEST CASE

IN these pages on February 19 it was surmised that the ordering of Comet 4B noise tests at London Airport was one of the motions through which the Minister must go before he "inevitably permits jet take-offs from London Airport at night." Evidence that this permission is virtually taken for granted appears in BEA's provisional summer timetable for 1960. At various times during the summer (take-offs and arrivals are earlier by one hour over the periods April 1-9 and October 2-31) there will be 10 Comet 4B take-offs or arrivals outside the "waking hours" limits of 0700hr to 2300hr.

The number of take-offs within these limits applies provisionally to three services: the mid-summer night tourist service to Nice which leaves seven times a week at 0250hr; the weekend night-tourist service to Copenhagen leaving at 0200hr; and the Comet night-tourist service to Zurich which is to leave nightly at 0145hr.

The remainder of the "sleeping hour" movements are arrivals, most of which (from Berlin, Zurich, Rome and from Munich) are scheduled to arrive at 0600hr, except during the period April 1-9 and the month of October when arrivals will be an hour earlier. There are also a number of arrivals within half an hour of each side of the 0700hr limit, such as the weekend Comet flights from Copenhagen (0645hr) and from Nice (0735hr, except during the two periods mentioned earlier, when arrivals will be at 0635hr).

BOAC have so far (see *Flight*, January 22, 1960) kept all their jet schedules just within the waking-hours limits, although departures are scheduled for 2300hr on Thursdays and Sundays.

### DEVELOPMENTS OF THE CL-44

THREE variants of the Canadair CL-44 were enumerated by Karl H. Larsson, Canadair's director of commercial aircraft sales, in a presentation of the aircraft made recently to the CAB in support of its customer-airlines Flying Tiger and Slick. (The Board is investigating airline permits for the inter-state carriage of freight, and the carriage of subsidized or non-subsidized mail.)

All 17 of the swing-tail CL-44-D4s now in production for Flying Tiger, Slick and Seaboard and Western will be delivered by July 1961; an additional eight can be completed by October and another 11, if needed, by the following February. The -D5 domestic variant could be coming off the assembly lines by November if not more than 25 -D4s are required. At some expense in range, the -D5 can lift 77,392lb of payload compared with the 66,128lb of the -D4. Maximum-payload range will be 2,200 miles, whereas max.-payload range of the -D4 is 3,050 miles. By August 1962 30 CL-44-D5s could be built.

The third variant is the -D6, to be powered by Stage 4 Tynes. Payload would be about the same as the -D5, but a 20,000lb increase in maximum weight to 225,000lb would give a max.-payload range of 3,350 miles. The -D6s could be made available in August 1962 and 30 could be completed by the following July. Mr Larsson gave as direct operating costs per ton-mile, over ranges with maximum payload, 4.09 cents for the -D4, 3.46 for the -D5 and 3.58 for the -D6; on international operations with the -D4 and the -D6 these would rise to 4.4 cents and 3.79 cents.

### SHADES OF THE DC-7D

MEMORIES of the long since deceased Douglas DC-7D project of 1955, which was to have been a turboprop development of the DC-7B powered by four Rolls-Royce Tynes (it was also known as the DC-7T), have been revived by reports from America suggesting that American Airlines are planning to convert up to 20 of their remaining DC-7Bs to Rolls-Royce Tyne power. "No comment" is Rolls-Royce's reaction to publication of this report.

It is understood that the converted aircraft would be used by American for passenger work. Ten other DC-7Bs in American's fleet have been allocated for all-cargo operation (see table), at least five already having been converted by Douglas to DC-7F standard.

## MORE PAYLOAD FOR THE ARGOSY

JUST announced by Armstrong Whitworth is a 6,000lb increase in the take-off weight of the Argosy, bringing it to 88,000lb. This has been achieved as a result of recent flight and structural testing and at the expense of a modest 483lb in additional structure weight. The greater maximum weight permits an increase in payload of 1,000lb—maximum payload is now 28,000lb—and a 50 per cent increase in the fuel which can be carried with maximum payload. Payload-range performance has benefited correspondingly; range with maximum payload has been considerably increased; a payload of 25,000lb, for example, can be now carried 750 miles instead of 500 miles as formerly.

Zero fuel weight has been increased by structural modification from 74,000lb to 76,000lb (permitting a greater load in the fuselage to impose more bending moment on the wings) but landing weight remains unchanged at 80,000lb under British certification and 78,000lb under American; this has the effect of limiting payload to 26,800lb (80,000lb landing weight limit) or 24,700lb (78,000lb limit) over short stages. The most economic range, previously 350-600 miles, is now 600-750 miles.

The effect of the increased structure and fuel system weight (about 250lb in the latter case) is to reduce the range with maximum fuel and zero payload from 2,400 st miles to 2,250 st miles with full reserves, and a "more realistic" ultimate no-reserve range of 2,500 st miles is now quoted in a new AW.650 brochure. Mean cruising speed is given as 280 m.p.h. instead of 276-296 m.p.h. as previously. Max. cruise is 297 m.p.h. true.

## PARIS WITHOUT FRILLS

FOR the first time in the history of London - Paris direct air services, from April 1 this year tourist-class flights by BEA and their pool partners Air France will be without meals, refreshments or bar service. In addition, fares will be cut by about 11 per cent tourist and 17 per cent night tourist.

While the elimination of catering on a bilateral basis is not prohibited by IATA, it has proved particularly difficult for BEA to achieve it in the face of resistance from other European air lines; it was this and an "across-the-board" 15-20 per cent tourist cut that the corporation would have liked to press at Honolulu. They compromised on reduced holiday fares, but they have now gone ahead with a "regular" fare reduction on the London - Paris route. This has been done on a bilateral basis with their pool partner Air France. The ordinary tourist return is reduced from £16 16s to £14 19s and night tourist from £11 19s to £9 19s.

## AERODROME OWNERS' PROBLEMS

CRITICISM of the Customs policy at airports, and of the lack of financial assistance from the Government for airport operators, was voiced by several speakers at the annual dinner of the Aerodrome Owners Association in London on February 25. Earlier the same day a delegation from the Association had discussed their problems with the Minister of Aviation, and Mr Sandys had promised that their views would be carefully considered.

The president of the British Independent Air Transport Association, C. J. Stevens, emphasized at the dinner that AOA expansion would be linked to that of the independent operators, and expressed the hope that the new licensing bill would provide opportunities for increased activity at members' airports. The chairman of the AOA, Wg Cdr T. C. Chambers, called attention to the enormous scope for business aircraft in this country. This development was sure to come, he said, and it could not take place without a greater number of active airfields. Other speakers at the dinner were Charles M. Newton, past chairman of the Association; Sir William Strath, Permanent Secretary, Ministry of Aviation; Mrs Pearl M. Hyde (deputizing for F. H. O'Donnell, vice-chairman of the Association) and Air Cdre Sir Arthur Vere Harvey, MP.

## NEW DC-8 NOMENCLATURE

UNLIKE Boeing, who market half a dozen variants of the 707 each with its own type-number, Douglas have until now given no numerical or alphabetical designation to any of the five models of the DC-8, as they did with the DC-6 and DC-7. In view of the confusion that has sometimes arisen, the various DC-8 models are now differentiated as follows: *domestic JT3 model*, DC-8 series 10; *domestic JT4 model*, DC-8 series 20; *intercontinental JT4 model*, DC-8 series 30; *intercontinental Conway model*, DC-8 series 40; *intercontinental JT3 turbofan model*, DC-8 series 50.

Another DC-8 designation, as yet unofficial, is DC-8A, the long-awaited all-cargo development of the DC-8 for which the following figures have been quoted by Douglas: powerplant, P & W JT3D-9 turbofan (wet) or Rolls-Royce RCo.42; max. take-off weight, 350,000lb; max. landing weight, 273,500lb; max. zero fuel, 247,500lb; max. fuel (at 6.7lb/gal), 154,540lb; max. revenue payload (palletized), 111,941lb.

Douglas say that a prototype DC-8A (JT3D) could be flown early in 1962. Orders of between 5 and 10 would be needed to begin production; unit cost has been reported as about £2½m. Douglas would require 35 months from order to certification.

# A VANGUARD ON BEA ROUTES

AS part of its certification trials, a Vanguard last week began a 200hr, five-week programme of proving flights on BEA routes, involving operation, passenger handling, maintenance and turn-round procedures. Starting each morning from London Airport, Vanguard G-APED, the fourth BEA machine, is making return trips to one or more destinations each day, covering the network between Stockholm, Gibraltar, Benghazi, Zürich and Düsseldorf. Crews consisting of three pilots and four or five cabin attendants are drawn from BEA, who already have ten trained Vanguard pilots including Capt A. S. Johnson the Vanguard Flight Manager, and from the Vickers flight test team and ARB pilots. The cabin of this aircraft is fitted with a sample 100-seat layout in the definitive BEA cabin décor. Manufacturers' and airline personnel are forming passenger loads, the full complement being carried to Malta and Stockholm—representative hot and cold places. A night stop is also being made at each of these two points. The complete 200hr programme will include check As and one check 1 to be carried out by BEA.

The first ten pilots were trained partly by Vickers and the first of BEA's pilots' courses is to start on April 2. The Vanguard will enter scheduled service on the London - Paris run on July 1 (see "Paris Without Frills" above) and will soon afterwards be put on the London - Malta service.

A *Flight* representative flew last weekend to Paris and back together with some 40 other "passengers." The Vanguard made times of 42 and 43min—a performance which will allow BEA to schedule the Vanguard for flight times shorter than those at present achieved by the jet airliners. The interior décor is red, grey and black with a ceiling lighting arrangement giving an excellent impression of spaciousness. The central cabin contains 63 exceptionally comfortable six-abreast seats and there are smaller five-abreast cabins at front and rear. Noise level appeared virtually constant throughout the length of the fuselage and permitted absolutely normal conversation. Noise was generally of fairly low frequency which enhanced the steady, big-aircraft feeling conveyed by the spacious cabin. Hydraulic air stairs at front and rear greatly assisted passenger loading. BEA pilots warmly praised the spacious and tidy flight deck. All in all the Vanguard offers a tempting prospect of a gentlemanly and expeditious form of mass transport.

**Footnote:** Spectacular improvements to the commercial capabilities of the Vanguard, foreshadowed in *Flight* for February 12 (page 220) were confirmed last week. Max. payload goes up by 8,000lb to 37,000lb; max. take-off is now 146,500lb (up by 5,500lb); max. landing weight, 130,500lb (up by 9,500lb); and max. zero fuel weight, 122,500lb (up by 10,000lb). Corresponding empty weight increase is only 600lb.

"Flight" photograph

*Seen at Le Bourget is the Vickers Vanguard G-APED, the fourth BEA aircraft, after last Sunday's London - Paris proving flight. A note above discusses this event, and gives news of important improvements to the type*

*Now being trained by BOAC are the future managers of Ghana Airways. Some will be here for two years, others for six, and many will attend universities. Others will spend some time at BOAC's overseas stations. Below are discussed present trends in Ghana Airways*

## AIR COMMERCE . . .

### GHANA PUTS FIRST THINGS FIRST

THE proposed re-organization and expansion of Ghana Airways, says the Minister of Transport, Krobo Edusei, "will be geared to expand and develop Ghanaian influence to the greatest extent possible, both in the continent of Africa and elsewhere." The Minister has confirmed that Ghana proposes to buy out BOAC's nominal 40 per cent holding in Ghana Airways (*Flight*, January 22, page 125).

Instead of operating Britannias chartered from BOAC, Mr Edusei says Ghana will acquire its own fleet of airliners, either by lease or by outright purchase. For a start it will "acquire" two Britannias 102s from BOAC. Meanwhile, future management staff of the airline are being trained in the UK by BOAC (see photograph). The present agreement with BOAC was discussed at a recent Ghana Airways board meeting, at which BOAC Associated Companies were represented by Sir Duncan Cumming.

The Minister, Krobo Edusei, says that the present arrangements with BOAC "do not fully portray the Ghanaian Government's policy." Why, he asks good humouredly, "should there be British hostesses on our services when Ghana has the most attractive girls in Africa? Why should cutlery and napkins be marked BOAC?" But the past deficiencies, he says, have not been the fault of BOAC—and it is his Government's intention to continue the "excellent relationship" with BOAC which has existed to date.

He explains that the new routes that are to be inaugurated by Ghana Airways may be uneconomic at first, but "the imponderable benefits which will nevertheless accrue to Ghana's prestige overseas and to our international trade generally far outweigh such considerations." Henceforth the interiors of Ghana's aircraft will, he says, reflect the Ghanaian and African personality; all staff, as far as they are qualified, will be Ghanaian, but all staff, whether Ghanaian or foreign, must wear the Ghanaian uniform.

The Minister has announced a new Ghana Airways service calling at Kano, Nairobi, Khartoum and Cairo and an agreement about a service to Addis Ababa is under negotiation. It is Ghana's intention, he says, "to link together the independent African states."

### TRENDS IN THE CARIBBEAN

THE national airline of the West Indies Federation, BWIA, is shopping for American jet transports. The chairman, Hugh Wooding, has recently been visiting US West Coast manufacturers, and a decision is expected to be announced in the next two months. British equipment is being considered also but, according to reports from America, the order is "almost certain to go to a US manufacturer."

These rather surprising developments need putting into perspective. Though BWIA is still wholly owned by BOAC, it is an associate that may well become independent with the Federation, perhaps 18 months or two years hence. The airline's financial results—a loss of £592,000 in 1958-59—have been described by the chairman of BOAC, Sir Gerard d'Erlanger, as a matter about which the Corporation has been "extremely worried and concerned . . ." Although the company is owned by BOAC, "the Federation, Ministers and other people do regard it very much as their airline, as the key to the development of the Federation. Its staffing is practically entirely West Indian. We have been trying to inject into the organization a non-West Indian as managing director, and we have met with never ending good reasons why it should not be done, why it will cause offence to the West Indies."

Since these remarks, made just over a year ago, Hugh Wooding took over the chairmanship of BWIA from Sir Errol dos Santos, who became president.

Obviously, the extent to which the airline swings away from the corporation's influence must be carefully watched. There is no doubt that this is a matter very much in the minds of BOAC's board; Mr Smallpeice, managing director, has said in the context of BWIA: "It is of great importance to us to have our main trunk routes throughout the world buttressed by companies which are in sympathy with us rather than in opposition to us, as would be the case if KLM or Pan American or other people were interested in these companies. So, from that point of view, I think there are good reasons why we should want to maintain close associations with [BWIA]."

It now remains to be seen whether the Federation is expecting to acquire the whole of BOAC's interest in BWIA. Certainly the Federation is most concerned to see that its national airline gets a full share of the forthcoming tourist boom in the Caribbean, and it is significant that a delegation representing the West Indies (who have become increasingly sensitive about HMG's responsibility for the routes affecting their tourist industry) has been sitting in on the recent UK/US air agreement talks in Barbados. It is also significant that Ross Stainton, BOAC's Western-routes manager, should have made a point in Jamaica last week of emphasizing BOAC's plans to reduce UK - Jamaica fares by 20 per cent and to increase services by 60 per cent.

### BIG JETS AND CONWAYS

AS reported last week, the first Conway-powered Boeing 707-420, an Air-India aircraft, passed through London on Saturday, February 20, on a delivery flight to Bombay. A non-stop flight was made from London to Bombay, a flight-plan distance of 4,261 nautical miles, in a flying time of 8hr 29min. Some facts and figures in respect of this record flight are now available: Take-off weight at London, 293,350lb; CAR runway length required, 6,400ft to 35ft; fuel weight 142,451lb; crew and payload, 24,504lb; estimated landing weight at Bombay, 187,088lb; estimated fuel used, 106,263lb. Fuel consumption at Mach 0.82 and 33,000-37,000ft was measured (in kg) at 1,600kg/hr/per engine.

The Rolls-Royce Conways at present entering service are RCo.12s of 17,500lb static thrust. The developed RCo.42 Conway of 20,250lb thrust, as specified for the VC10, will be available in 1962. Meanwhile, to take advantage of this, Boeing have given a few details of the 707-520 to be powered by RCo.42s. For the record, a take-off weight of about 340,000lb is scheduled, and the fuselage will be extended 10ft beyond the 152ft 11in of the -320 and -420 models. The RCo.42 will have a 10 per cent better specific fuel consumption than the RCo.12—0.785 at 35,000ft and 475kt compared with 0.874.

Douglas, too, have announced a DC-8 development to take advantage of the RCo.42, though as an alternative engine to the P & W JT3D-9. This is the DC-8A all-cargo project, some details of which appear on the previous page ("New DC-8 Nomenclature").

*Yesterday, March 3, was the day on which Lufthansa were due to take delivery at Hamburg of the first of their five Boeing 707-420s. A note on this page gives some facts and figures about the performance of the first Rolls-Royce Conway-powered 707 to be delivered—the Air-India aircraft which recently flew non-stop from London to Bombay*

## PILOTS AND RADIATION

FOR two years IFALPA, the International Federation of Airline Pilots, has been concerned about the degree of radiation to which crews may be exposed in the course of their duties. Following the recent French atomic-bomb tests in the Sahara, IFALPA members *en route* over this area carried out geiger-counter checks to compare the degree of radiation with the "normal background" measured earlier in the year, which was of the order of 0.05 to 0.10 millirem/hr.

On February 13, between 22 and 41 hours after the explosion, readings were taken on a southbound and on a northbound flight between Tripoli and Kano. Readings up to 50 times higher than the "normal background" previously measured were recorded.

IFALPA say they are aware that the radiation levels recorded appear to be less than those quoted for the normal X-ray dose, but say that such a comparison may be misleading. The Federation is of the opinion that "some authoritative quantitive statement of the maximum tolerable 'breathing' and 'whole body' doses is required." Their enquiries over the past year have not been successful, and they feel that the public as well as their members have a right to know. Meanwhile IFALPA will "continue to monitor the neighbourhood of all future atomic explosions and to publish the results."

## STARWAYS IN THE CLEAR

AFTER a seven-hour hearing at Altrincham, Cheshire, on February 22, Starways were cleared of charges that a DC-3 was operated overloaded and not in compliance with the conditions of its Certificate of Airworthiness on a flight from Perpignan to Manchester.

The prosecution alleged that the maximum permissible weight of the DC-3 was 28,000lb (12,700kg). The load sheet, signed by Capt P. H. Meadway, showed that before take-off the aircraft weighed 12,704kg, but that this figure had not taken into account 272kg of fuel remaining in the tanks before refuelling. With other factors the DC-3 was "something close to 400kg" overloaded, which meant that "if it had run into freak weather, or if an engine had failed, the crew and 34 passengers might have been in danger."

Capt Meadway, whose 15,000hr include 6,000hr on DC-3s, said: "Nobody but a fool would dream of putting on a pound more than necessary to get off. As a pilot trained in the old school, my first consideration is for the safety of my passengers. If this extra weight had been present, I could not have helped noticing it."

Counsel for Capt Meadway said that he may have been a little foolish in signing the fuel receipt without checking it, but otherwise there was no evidence against his client worth considering.

The chairman said "We have listened to this case with considerable interest, but we have very considerable doubt in our minds. Under the circumstances we have decided to dismiss the charges."

## THE WORLD'S BIGGEST AIRLINE

THERE are quite a few claims to the title "World's Biggest Airline," but much depends upon which measure of size is taken. Probably the most generally accepted measure is total revenue load ton-miles carried per year. This being so, the world's biggest airline in 1959 (if we exclude Aeroflot, whose traffic figures are never published) was American Airlines. TWA came second, PanAm third, and United fourth.

In terms of *passengers carried*, as opposed to load ton-miles, the order was as follows (figures rounded off): (1) American, 7.65m; (2) United, 7.15m; (3) TWA, 5.51m; (4) PanAm, 2.96m.

Reverting to the load ton-mile picture, the order of precedence was as follows (figures, in short-ton statute miles rounded off): (1) American, 688m, of which 673m was domestic; (2) TWA, 643m, of which 500m was domestic; (3) PanAm, 625m; (4) United, 617m.

A remarkable fact which emerges is that United Air Lines have fallen well below the premier position they held in the previous year, 1958 (see *Flight* for February 6, 1959). Mr Patterson has been overtaken by not only his keenest rival, C. R. Smith of American, but also by TWA and PanAm. Notwithstanding Air France's claim to be the world's biggest airline (based on route mileage flown, perhaps), the French airline carries only about half the load ton-miles uplifted by American Airlines.

The two British corporations, BOAC and BEA, carry (respectively) only about a third and a sixth of the traffic carried by the world's biggest airline.

# BREVITIES

IFALPA's 15th annual conference is due to take place in Istanbul from March 22-29.

The name proposed for the Latin American "Air Union" (*Flight*, February 19), is Flota Aerea Latino Americana.

CPAL have been granted fifth-freedom rights by the Portuguese Government between Lisbon and Rome on their Montreal - Rome service.

A market survey of European travel has been launched by the International Travel Market Research Council. Enquiries should be addressed to the ITMRC at 12 St George's Road, London NW11.

IATA's 13th annual technical conference is to take place at Lucerne, Switzerland, from May 2-10. Sessions will be held in the Congress Hall under the chairmanship of Knud Hagrup, of SAS, chairman of IATA's Technical Committee.

The new international airport at Nandi, Fiji, was officially opened last month. New Zealand, Australia and the UK have shared the £3m reconstruction which includes extension of the main runway to 10,500ft. A second runway is 7,200ft long.

A pool agreement between Air France and Japan Air Lines covering the Polar route between Tokyo and Europe was signed on February 22 in Tokyo. Air France's 707s will operate, with JAL insignia as well as their own, until JAL's DC-8s enter service in the spring of 1961.

An overhead railway linking Vnukovo Airport and Moscow's south-western suburbs is now under consideration. Tracks would be laid over concrete trestles 33-40ft high and about 100ft apart. Coaches would each seat 75 passengers and travel at a height of about 20ft above ground.

LOT have decided to buy a fleet of Baade BB-152 jet transports from E. Germany, for service in mid-1962. A contract for three Il-18s has meanwhile, it is reported, been signed with the USSR. The Polish airline studied "all available types," including the Comet 4B, Caravelle, and Viscount 810, before deciding its re-equipment programme.

The North Atlantic jet surcharge, which was to have been discontinued on March 1, will remain in force until April 30—along with the other "unresolved" IATA fares which are due to expire on March 31. The IATA traffic conference's secret discussions in Paris, which began on February 24, were last week said by V. H. L. du Boureq, chairman, to be "progressing satisfactorily."

According to a report in the *New York Times* the Russians have submitted the Tu-114 for noise tests by the Port of New York authority. This revives speculation about possible Soviet plans for the introduction of air services between the USA and the USSR. According to a statement by the deputy transport manager of Aeroflot, Georgiy Peskov, the Tu-114 will enter operational service this spring. This is some six months behind the original schedule quoted by Aeroflot in Moscow last May.

The formation of a new air transport company in Nigeria, Aero Contractors Nigeria Ltd, has been announced in Amsterdam. The president of the new company is Bank Anthony, a Lagos industrialist.

Dove G-AMKT owned by Gulf Aviation and on hire to Hunting Aerosurveys crashed and was written off near Lahore, Pakistan, on February 19. The pilot, C. Veitch, and the co-pilot, Mr Burnham, were killed. The engineer, Mr Morgan, was seriously injured.

Hunting-Clan announce the appointment of H. St. George Bond as HCA representative in Geneva, a new post to promote "the general advancement of Hunting-Clan interests in the Common Market countries and in Switzerland and Austria." These interests include charters, contracts, inclusive tours and scheduled services, and the Africargo service.

***Soon to take up a new appointment in Australia is Douglas Laurie. TAA remind us that he has "spent £10m on British aircraft in the five years he has been TAA's UK manager." He is succeeded in London by Ross Meehan***

The Peruvian airline APSA is reported to have ordered two Lockheed Electras for delivery in May and June 1961. They will be used on the airline's routes linking Lima with Panama City and Buenos Aires. The order, if confirmed, will bring the Lockheed Electra order book to 174.

Losses of BOAC Associated Companies are "not expected to be more than £¼m in the next financial year," according to a statement by Lord Mills, Paymaster General, in the House of Lords.

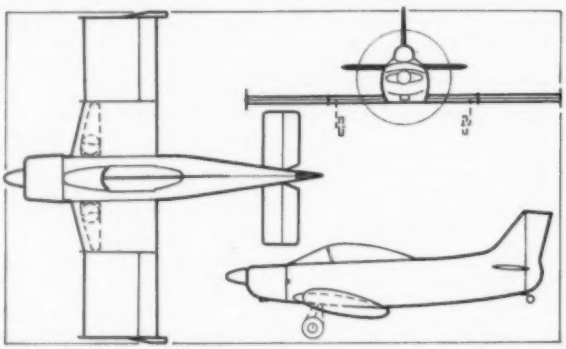
Pipeline delivery of aviation fuel to London Airport is to start this month. Two 6in pipes, running nine miles underground from Walton-on-Thames, will feel two Shell-Mex and BP storage points at the airport. Up to now road tankers have delivered fuel from Purfleet and Shellhaven: a daily average of 40 tankers has been needed for the round trips of about 80 and 100 miles to the airport and back.

The cause of the accident to the BOAC Comet 4 G-APDL which made a wheels-up landing at Rome on December 23 is now established. In answer to a *Flight* enquiry, a BOAC spokesman last week said: "The corporation has now completed its investigation into the incident. This has shown that there was no fault in the system and that when the aircraft landed the landing gear was in the retracted position. Disciplinary action has been taken."

# Sport and Business

FIRST AWARD of the Foster Boomerang, a London Gliding Club trophy for the best out-and-return flight from Dunstable, was made to Geoffrey Stephenson (158 miles to Malvern Beacon) at the club's annual dinner on February 20. The award has been established in memory of Capt Frank Foster, one of the club's leading pilots who died in the Viscount accident at Nettuno in 1958. Among other presentations were the Dent Trophy for the best flight from Dunstable, to Archie Erskine (186 miles to Roborough in an Olympia, using blue thermals all the way); the Desoutter Cup for the best constructional effort, to Chuck Bentson for his work on two new club trailers; the Derry Trophy for the best work for the club to Geoff Nixon for his transport activities; and the Cellon Cup for the best *ab initio* pilot to Tom Zeally.

The 30th anniversary of the club's formation was celebrated at the dinner, and an historical theme ran through several of the speeches. The chairman of the club, Godfrey Lee, recalled that, during the "golden age" period of the 1930s, it had been at Dunstable that the techniques of hill, thermal and cloud soaring were pioneered. For the future, there were two possible further developments: wave soaring in the region of jet-stream systems, and dynamic soaring using the wind gradient near the surface. What



*Two-seater successor to the Tempête, the Jurca-designed MJ-5 Sirocco is powered by a 90 h.p. Continental. This aircraft, it has been suggested, could be an eventual replacement for the Stampe, and is designed to be equally suitable for aerobatics, touring and club training*

type of sailplane should be developed to explore dynamic soaring? The British Gliding Association, or someone else, ought to find out.

Among other speakers at the dinner were club president John Furlong, Dudley Hiscox, John Hands, Mrs Bonny Bentson and Paul Zander (a glider manufacturer during the early years of the club's existence). Mr Hiscox recalled that the club's first aerotows had been made at what is now London Airport; the towing aircraft had been Lynx-powered Avro 504s, and the cost had usually been 15s to 2,000ft.

A LUTON LA5 MAJOR should soon be making a sharp contrast to the Vulcans of RAF Waddington in the airfield circuit. The Major is being built by members of the RAF Waddington Popular Flying Group, which was formed in January and which has as president the station commander, Gp Capt D. Iveson. Plans for the machine were purchased from Phoenix Aircraft Ltd of Cranleigh; wood has been obtained from Slingsby Sailplanes Ltd of Kirbymoorside; and the group reports that it has its eye on a 65 h.p. Lycoming engine.

It is hoped to complete the aircraft by May 30 and to have as its registration G-ARAF. Group membership totals 58, of whom ten are working on the aircraft and the remainder on construction of a clubhouse. Subscriptions vary from 18s (airmen) to 30s (officers) per year, and the planned flying rate is only £1 per hour.

RECENT DEVELOPMENTS in the activities of Imperial College Gliding Club mentioned at the club's annual dinner on February 26 included the move from Lasham to Redhill and the replacement of veteran T-21B *Daisy* by a new T-42 Eagle. Operations at Redhill are closely associated with those of the Tiger Club, who carry out the gliding club's aerotows, and Tiger Club chairman Norman Jones was among the top-table guests at the dinner. In memory of *Daisy*, who in her ten years and four months with the club had logged 35,500 launches and had been pushed the equivalent of the distance from Lasham to Toledo and back, an Ann Welch painting of this glider was presented to the Rector of the college, Sir Patrick Linstead, for the club by vice-presidents Frank Irving and Paul Minton.

In a review of the club's plans for the future the captain, Roger Vaile, said that, for the first time, an IC undergraduate team entry would participate in one of the National Gliding Week contests this year. Other speakers at the dinner included Don Zimmerman, Lorne Welch and Ken Machin.

A TURBOPROP-POWERED VERSION of the Morava L-200 five-seater, known as the L-300, is now being developed. This was disclosed by Dr Varicky of the Czechoslovak Aviation Research and Testing Institute recently. Czechoslovakia had decided to concentrate on the production of light aircraft and helicopters, he said, and to depend on other countries for large aircraft. Sales of Aero and Sokol aircraft were good, and many orders for the Morava L-200, now in series production, had been received from abroad.

The HC-2 ultra-light helicopter was in series production and was to be followed by the three-seater HC-3. The Czech industry was also working on the prototype of a six-passenger helicopter powered by "a turbine of up to 700 h.p." Research was now going into the construction of a tilt-wing aircraft which should fly in about twelve months' time but, for the time being, there were no plans to develop a VTOL aircraft on the Rotodyne formula.

A DONATION of £20 has been made by the Air League to the Tiger Club towards the cost of the club's new premises at Redhill Aerodrome. This gift was made in recognition of "the spirit of enterprise and self-help exemplified in the Tiger Club by the work to get a British pilot into the top placings in the 1959 Lockheed Aerobatic Contest, and the way in which members have worked on their clubhouse at Redhill."

ANNUAL PRODUCTION of non-airline civil aircraft in the United States will reach 10,000 machines by 1962 and 20,000 by 1965, according to a leading article in *The AOPA Pilot*, magazine of the Aircraft Owners and Pilots Association. The total number of aircraft delivered by the seven major "general aviation" aircraft manufacturers in 1959, approximately 7,700, was a 16 per cent increase over the previous year.

## RETROSPECT

### *From "Flight" of March 5, 1910*

*Another Apt Farman Pupil:* It is astonishing how easily some of the purchasers of Farman machines seem to learn the art of flying. M. Geo. Chavez, the well known French "Soccer" football player, recently took delivery of his Henry Farman machine at Chalons, and on the 28th ult. he had his sixth lesson and flew alone for close upon two hours. Starting soon after nine o'clock, he rose to a height of about 60 metres, and maintaining that altitude flew over the country around Chalons until his petrol supply ran out, when he landed safely just as the clock was striking eleven, having been flying for 1 hour 47 minutes.

*Paul K. Miller of Los Angeles, a Lockheed Aircraft engineer, designed and built this ultra-light single-seater, the Miller M-1, which is powered by a 40 h.p. Continental. The design incorporates folding wings and a steerable nosewheel: span is 24ft, gross weight 700lb and cruising speed 80 m.p.h.*